CONTENTS

TRADE NAME	MODEL	SET AND FOLDER No.
Aircastle	652.5X5	286-2
Arvin	21-550KB, KBU, KM, KMU, 21-551TB, TBU, TM, TMU, 21-552KB, KBU, KM, KMU, 21-553TB, TBU, TM, TMU (Ch. TE-379-1, TE-382-1) Tel. Rec. Prod. Chg. Bul. 127	286-1
Browning	RJ-49	286-3
Craftsmen	C1000	286-4
Firestone	13-G-167 (Code 280-4-21T19AGH) Tel. Rec.	286-5
Ford	5BF (FDH-18805-B1)	286-6
Motorola	34F1 (Ch. HS-444)	286-7
Olympic	402	286-8
Philharmonic	54CL021, 54CM21, 54TW21 Tel. Rec.	286-9
RCA Victor	5-EM-23, 5-EM-24, 5-EM-25 (Ch. RS-148)	286-10
Sylvania	410 Series, 410 "U" Series, 514 Series, 514 "U" Series, 525 Series, 525 "U" Series, 529 Series, 529 "U" Series, (Ch. 1-530-1, -2, -3, -4, -5, -6) Tel. Rec.	286-11
Westinghouse	H-482PR5 (Ch. V-2229-5)	286-12
Westinghouse	Ch. V-2313-15, -25, -35, V-2323-101, -122, -124, -201, -301 Tel. Rec. Prod. Chg. Bul. 127	286-1
Zenith	T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U) Tel. Rec.	286-13

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L. F. BLANKENSHIP
3934 MEADE ST.
DENVER, COLORADO

SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 2 IN SET 266

Arvin models 21-550KB, KBU, KM, KMU, 21-551TB, TBU, TM, TMU, 21-552KB, KBU, KM, KMU, 21-553TB, TBU, TM and TMU were covered in Photofact Folder 2 — Set 266 .

Circuit revisions were made in later production. With these changes chassis TE-379 and TE-382, respectively, become TE-379-1 and TE-382-1.

Ch. TE-379-1

TO IMPROVE PICTURE QUALITY

The UHF tuner has been changed to improve the picture quality under weak signal conditions . A partial schematic is given in Fig. 1 showing the new circuit.

Ch. TE-379-1
TE-382-1

FOCUS RANGE INCREASED

The PM focus unit (M10) hase been changed to part #42550-2 to provide a greater range of adjustment.

TO IMPROVE AGC STABILITY

R53 is decreased from 47KΩ to 1KΩ.

COMPONENT CHANGE

C52 is increased from 470MMF to 1000MMF.

A 1000MMF capacitor has been added in parallel with C40.

A 220KΩ resistor is added from one side of the AC line to the ground.

L36 (series peaking coil) changed to part #42762-6.

L37 (shunt peaking coil) changed to part #42762-7.

L39 (series peaking coil) changed to part #42762-9.

L40 (shunt peaking coil) changed to part #42762-10.

L41 (series peaking coil) changed to part #42762-11.

L42 (shunt peaking coil) changed to part #42762-8.

L47 (RF choke) changed to part #42762-2.

L48 (filter choke) changed to part #42760-2.

A filament choke (part #42761-1) in series with brown/black lead of T1, was omitted on the schematic.

VIDEO AMP CIRCUIT REVISED

A partial schematic showing the new video amp. circuit is given in Fig. #2.

Ch. TE-382-2

NEW VHF TUNER

Chassis TE-382-1 becomes chassis TE-382-2 when the new improved VHF tuner (part #42921) is used. Also, in chassis TE-382-2 the fuse (M1) is omitted.

A schematic of this tuner is given in Fig. #3.

ARVIN MODELS 21-550KB, KBU, KM, KMU, 21-551TB, TBU, TM, TMU, 21-552KB, KBU, KM, KMU, 21-553TB, TBU, TM, TMU

PRODUCTION CHANGES
BULLETIN 127

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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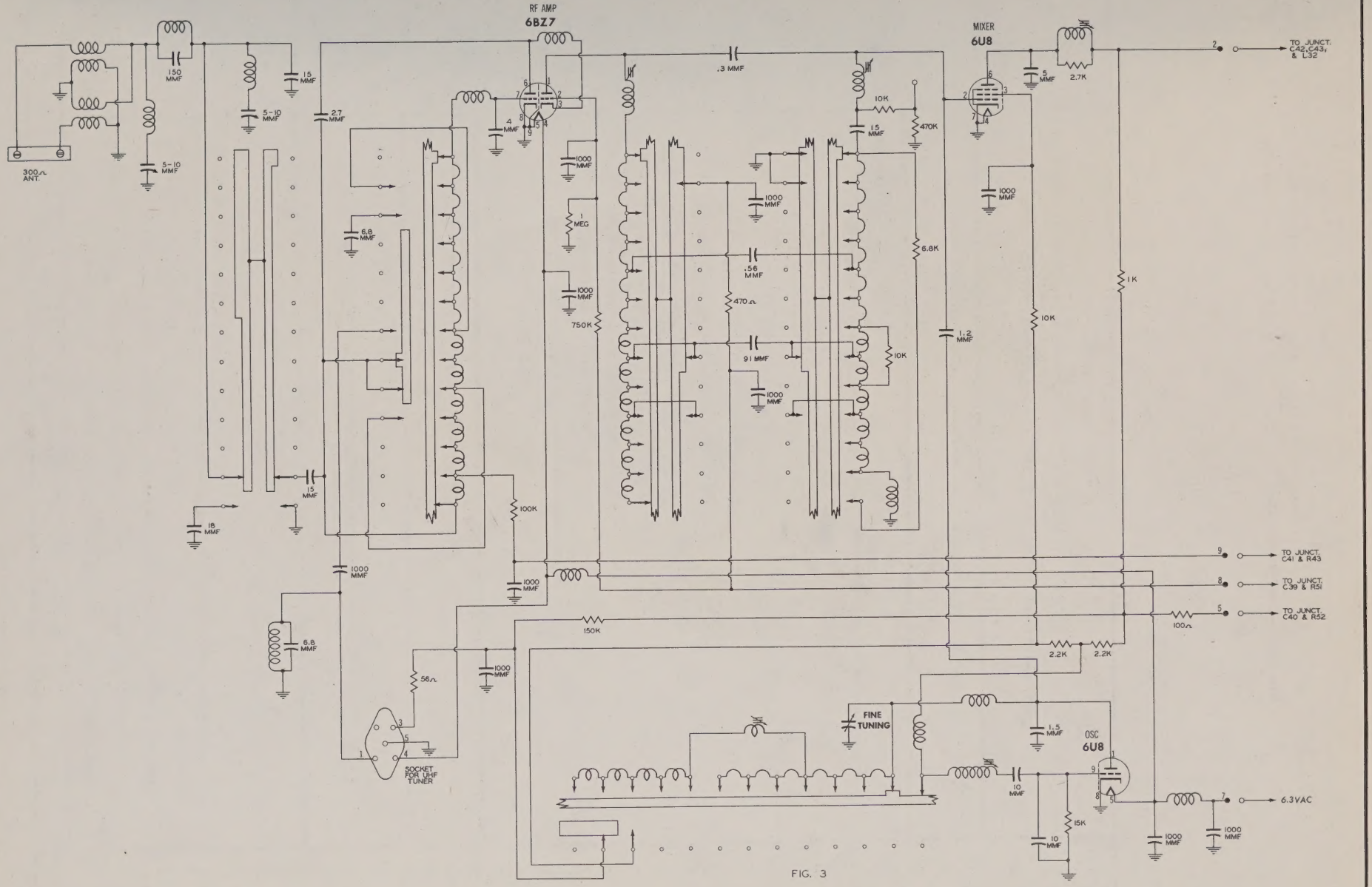
RF AMP
6BZ7
MIXER
6U8
OSC
6U8
300Ω ANT.
150 MMF
5-10 MMF
5-10 MMF
15 MMF
2.7 MMF
.4 MMF
.3 MMF
10K
470K
1.5 MMF
1000 MMF
1 MEG
6.8 MMF
750K
.56 MMF
470Ω
91 MMF
1.2 MMF
6.8K
10K
1K
5 MMF
2.7K
15 MMF
18 MMF
100K
150K
56Ω
2.2K
2.2K
100Ω
FINE TUNING
1.5 MMF
10 MMF
15K
SOCKET FOR UHF TUNER
TO JUNCT. C42, C43, & L32
TO JUNCT. C41 & R43
TO JUNCT. C39 & R51
TO JUNCT. C40 & R52
6.3VAC

FIG. 3

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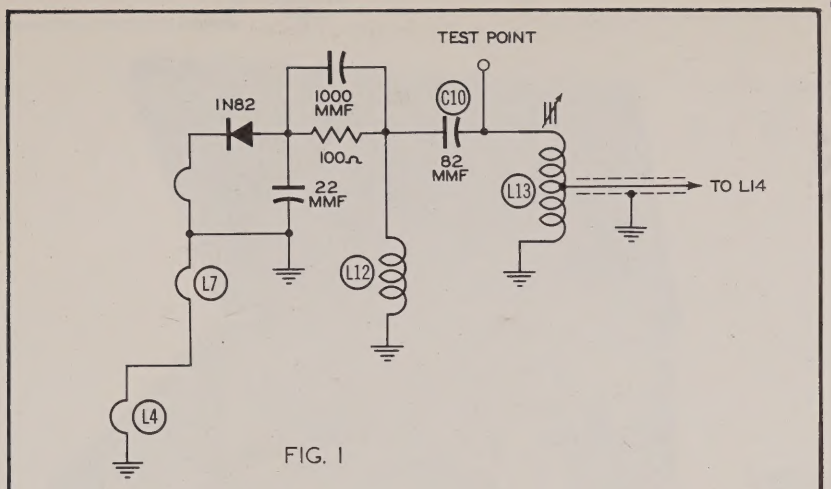


FIG. 1

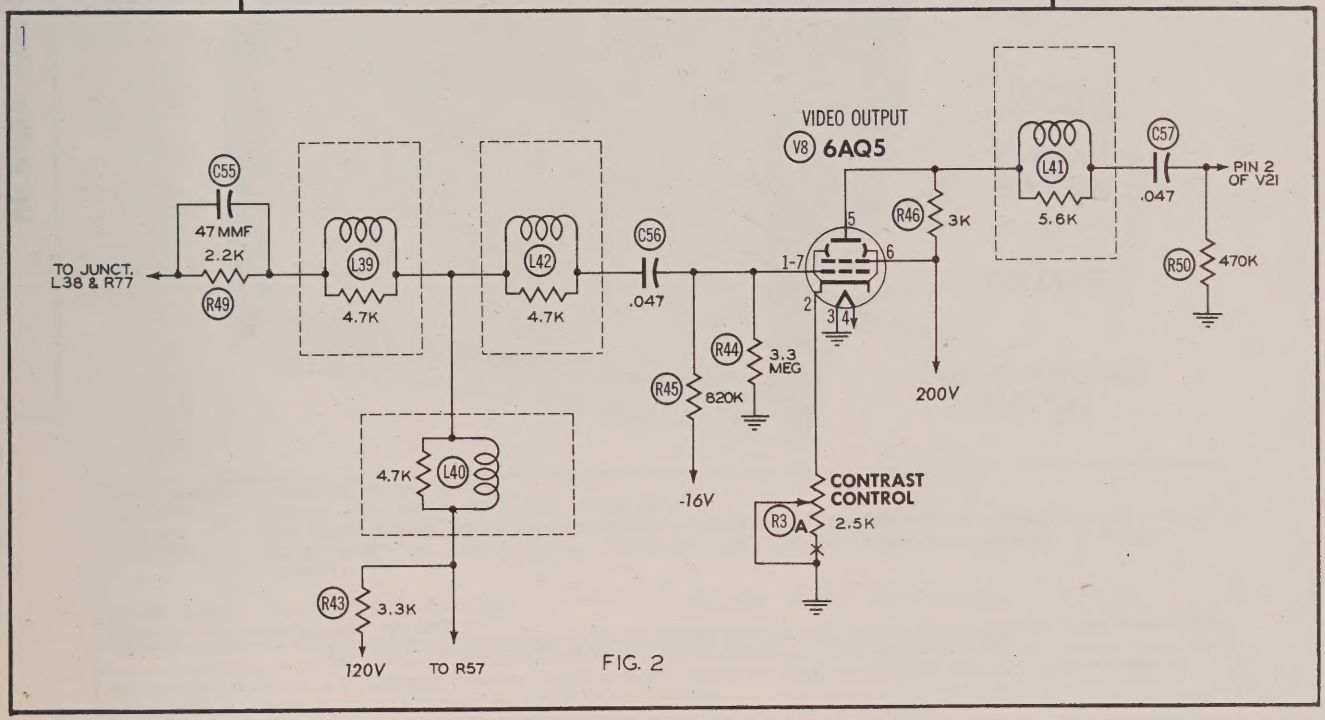
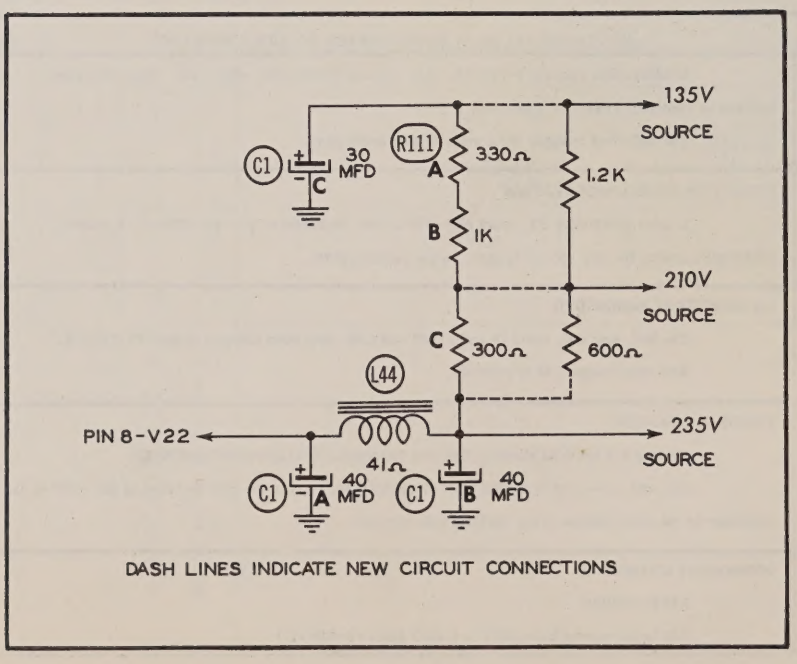


FIG. 2

	SUPPLEMENTAL DATA TO PHOTOFACT FOLDER 8 IN SET 270
	Westinghouse chassis V-2313-15, -25, -35 and V-2323-101, -122, -124, -201, -301 were covered in Photofact Folder 18 — Set 270. The following changes were made in late production.
	REDUCTION OF HUM MODULATION In later production R111 (part #V-14556-1) was replaced by part #V-10054-7. A partial schematic showing the new circuit is given on the reverse side.
	TO IMPROVE IF BANDWIDTH The 2nd. and 3rd. video IF coils (L25 and L28) have been changed to part #V-12128-2. With this change C46 is omitted.
	VERTICAL BLANKING To improve vertical blanking R80 was reduced to 820Ω (part #RC20AE821K). R82 was increased to 680KΩ (part #RC20AE684K) to hold the lock-in range of the vertical oscillator at the mid-position of the vertical hold control.
	COMPONENT CHANGE R29 is omitted. R30 is decreased from 10KΩ to 6.8KΩ (part #V-9927-20).

WESTINGHOUSE CHASSIS V-2313-15, -25, -35, V-2323-101, -122, -124, -201, -301



DASH LINES INDICATE NEW CIRCUIT CONNECTIONS

AIRCASTLE MODELS 652.5X5

PROPERTY OF
E. F. BLANKENSHIP
ST.

AIRCASTLE
MODELS 652.5X5

AIRCASTLE
MODELS 652.5X5

TRADE NAME	Aircastle Model 652.5X5
SUPPLIER	Spiegel, Inc., 1061 W. 35th. St., Chicago 9, Ill.
TYPE SET	AC Operated Radio-Phono Combination Superheterodyne Receiver With 3 Speed automatic Record Changer
TUBES (Six)	Types 12BE6 Conv., 12BA6 IF Amp., 12AT6 Det.-AVC, 12AX7 AF Amp.-Phase Inverter, (2) 35L6GT Output
POWER SUPPLY	110-120 Volts AC-60 Cycles — RATING .34 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	535-1620KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to pin 7 (grid) of 12BE6 (V1). Low side to chassis.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.	"	High side to antenna terminal lug. Low side to chassis.	1620KC	"	"	A5	Adjust for maximum output.
3.	"	"	1400KC	1400KC	"	A6	"

FOR SERVICE INFORMATION ON RECORD CHANGER UNIT - SEE V-M MODEL 950 - PHOTOFACT FOLDER SET #216 - FOLDER #11 OR RECORD CHANGER MANUAL CM-5.

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

AIRCASTLE MODEL 652.5X5

ITEM No.	USE	REPLACEMENT DATA: AIRCASTLE PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amp.	12BA6	12BA6	7BK	
V3	Det.-AVC	12AT6	12AT6	7BT	
V4	AF Amp.-Phase Inv.	12AX7	12AX7	9A	
V5	Audio Output	35L6GT	35L6GT	7S	
V6	Audio Output	35L6GT	35L6GT	7S	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: AIRCASTLE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	40	150	CE-1021			TCT3117	TDL-804020-150	FMT-333 / FM-1520	Yellow
B	80	150							Red
C	20	150							Blue
C2	10000		CC-103-5	DD-103	811-01	DC-511	IMP4-S1	330411	
C3	.05	200	CP-503-2	DF-503		PT415	IMP2-S5	330215	
C4A	100		♦PC-50	♦1403-01		UC-531		K-1310	
B	100					UC-531		K-1310	
C5	.05	200	CP-503-2	DF-503		PT415	IMP2-S5	330215	
C6	.05	200	CP-503-2	DF-503		PT415	IMP2-S5	330215	
C7	5000		CC-502-5	DD-502	811-005	DC-525	IMP6-D5	C-1250	
C8	.05	200	CP-503-2	DF-503		PT415	IMP2-S5	330215	
C9	100		CT-101-25	D6-101	GP1K-101	UC-531		K-1310	
C10	.0047	400		D6-472	GP2-333-472	PT6247	IMP6-D47	3306247	Note 1
C11	.1	200	CP-104-2	DF-104		PT401	IMP2-P1	330201	
C12	.1	400	CP-104-4	DF-104		PT401	IMP4-P1	330401	
C13	.1	400	CP-104-4	DF-104		PT401	IMP4-P1	330401	
C14	.05	400	CP-503-4	DF-503		PT415	IMP4-S5	330415	
C15	.05	400	CP-503-4	DF-503		PT415	IMP4-S5	330415	
C16	.1	400	CP-104-4	DF-104		PT401	IMP4-P1	330401	

Note 1. Not used in some versions.
♦ Items C4A, C4B, R8 are combined in one unit.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: AIRCASTLE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	3.25Meg	½	VC-1					Volume-tap @ 300KΩ
R2A	500KΩ	½	VC-51	Q13-133	A47-500K-Z	BSK-60-S	U-48	Tone - See Note
B	Shaft		Not Req.	Not Req.	KSS-3	Not Req.	Not Req.	Attach to R2A
C	Switch		Not Req.	76-1	SWE-12	Not Req.	US-26	Attach to R2A

Note. Tone control (part #VC-3) used in some versions of this model.

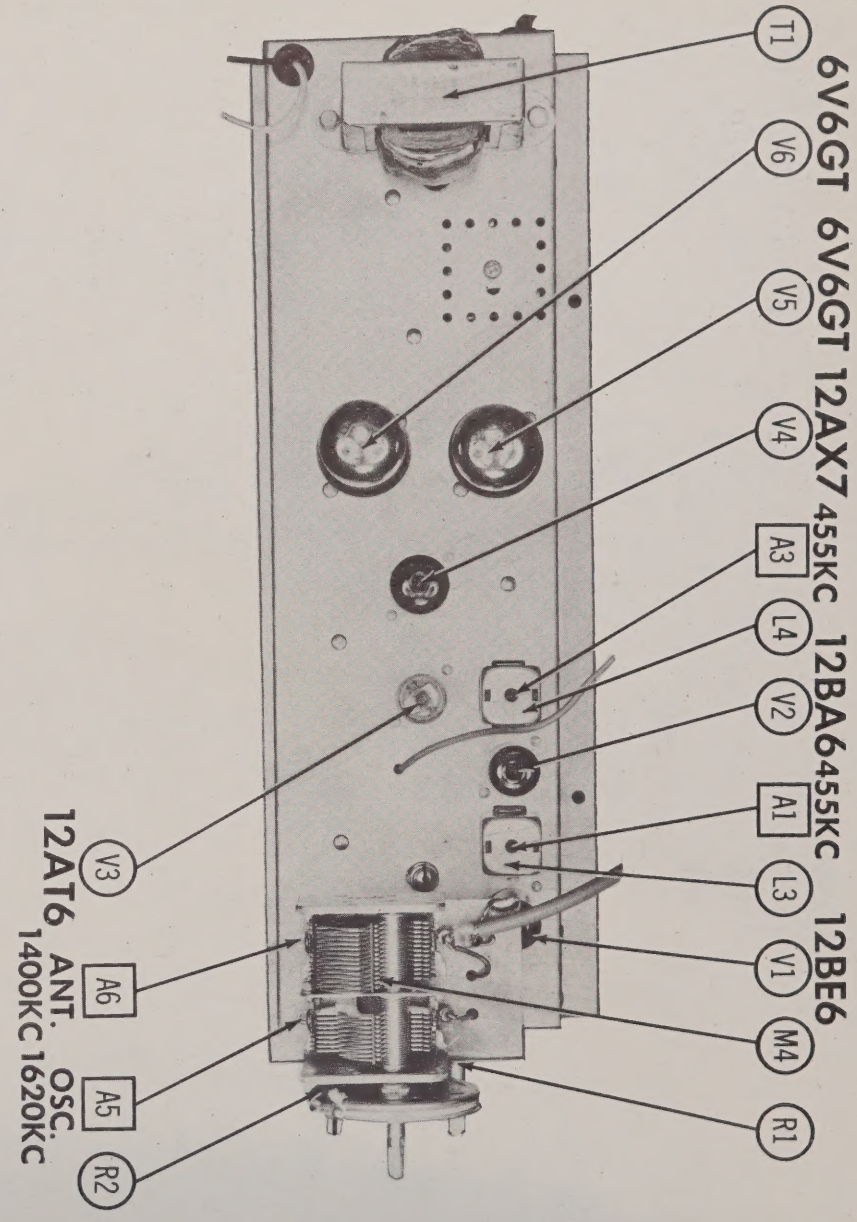
RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: AIRCASTLE PART No.	IRC PART No.	NOTES
R3	470KΩ	½	RC-474-3	BTS-470K	
R4	22KΩ	½	RC-223-2	BTS-22K	
R5	1.5Meg	½	RC-155-2	BTS-1.5Meg	
R6	220Ω	½	RC-221-2	BTS-220	
R7	220KΩ 5%	½	RC-224-2	BTS-220K 5%	
R8	47KΩ	½	♦PC-50	BTS-47K	
R9	47KΩ 5%	½	RC-473-3	BTS-47K 5%	
R10	10Meg	½	RC-106-2	BTS-10Meg	
R11	4300Ω 5%	½		BTS-4300 5%	
R12	220KΩ 5%	½	RC-224-2	BTS-220K 5%	
R13	47KΩ 5%	½	RC-473-3	BTS-47K 5%	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: AIRCASTLE PART No.	IRC PART No.	NOTES
R14	10KΩ 5%	½	RC-103-3	BTS-10K 5%	
R15	220KΩ 5%	½	RC-224-2	BTS-220K 5%	
R16	470KΩ 5%	½	RC-474-3	BTS-470K 5%	
R17	75Ω 5%	2	RC-750-9		
R18	470KΩ 5%	½	RC-474-3	BTS-470K 5%	
R19	4700Ω	½		BTS-4700	Note 1
R20	2200Ω	1	RC-222-5	BTA-2200	
R21	100KΩ	2	RC-101-8		
R22	22Ω	2	RC-220-9		
R23	2.2Meg	½		BTS-2.2Meg	Note 2

Note 1. Some versions use a 10KΩ resistor in this application.
Note 2. Not used in some versions.
♦ Items R8, C4A and C4B are combined in one unit.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA: AIRCASTLE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	6.6KΩ CT	1.75Ω	TR-113 TR-107 ①	Z1011	A-2901 ②	A-3830	24S61 ②	S-55X	① Alternate audio output transformer ② Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V. C. IMP.	REPLACEMENT DATA: AIRCASTLE PART No.	QUAM PART No.	NOTES
SP1	6"	PM	3.5Ω	SP-66	6A21LF	
SP2	6"	PM	3.5Ω	SP-66	6A21LF	

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: AIRCASTLE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Coil	.7Ω		LP-FE-14				
L2	Osc. Coil	.5Ω	5.5Ω	LC-10	14-1073		69-OSC	
L3	Input IF	20Ω	20Ω	LF-50	16-6758	BC-352	12-C1	
L4	Output IF	20Ω	20Ω	LF-50	16-6758	BC-353	12-C2	

SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	REPLACEMENT DATA: AIRCASTLE PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.108A	SE-1002	1005A	RS-150	6S150	6P2	150	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: AIRCASTLE PART No.	ASTATIC PART No. CARTRIDGE	ASTATIC PART No. NEEDLE	ELECTRO-VOICE PART No. CARTRIDGE	ELECTRO-VOICE PART No. NEEDLE	REMARKS
M2		55-T	GD-J	47	0-1 or S-1 & 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENT SEE BELOW.

PHONO NEEDLE

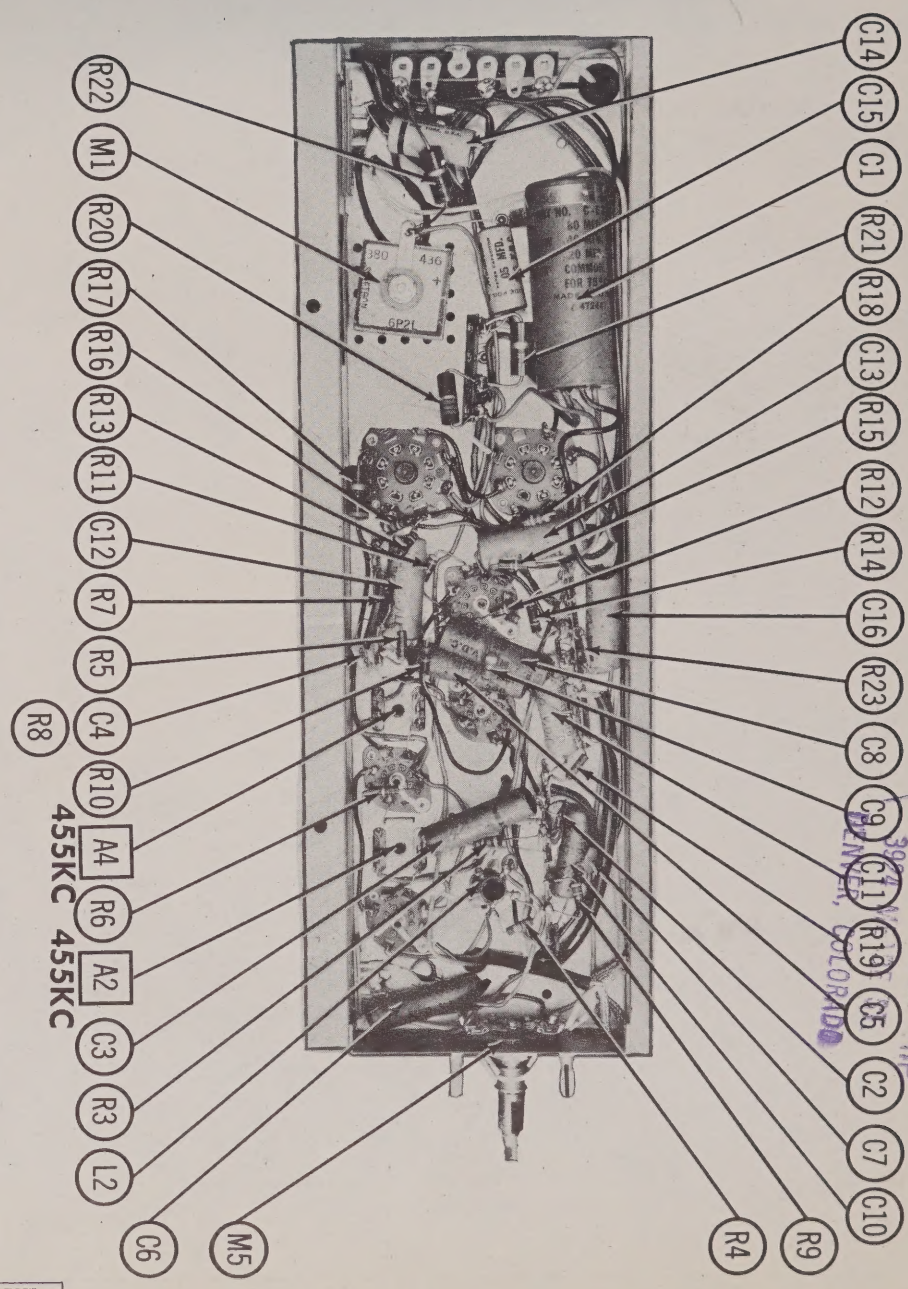
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA: AIRCASTLE PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M3		*S-67 or †S-66 or ♦†S-66SD or ♦S-66D	†AC-434 or ♦†AC-434D1 or †♦AC-434D2 or ♦AC-434D	†W-75TPS or ♦†W-75DS or ♦W-75TPD	* Metal † Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	AIRCASTLE PART No.	NOTES
M4	Tuning Cap.	CV-52	2 Gang (30-470MMF, 27-185MMF)
M5	Switch	SW-26	Radio-Phono (2 Pole - 2 Position)
	Cabinet	CA-1006	
	Knob	KN-10805-1	Selector
	Knob	KN-330V	Volume
	Knob	KN-330ST	On-off-tone
	Knob	KN-700-7	Radio-Phono switch
	Knob	KN-5206-5D	Tuning

CHASSIS—BOTTOM VIEW



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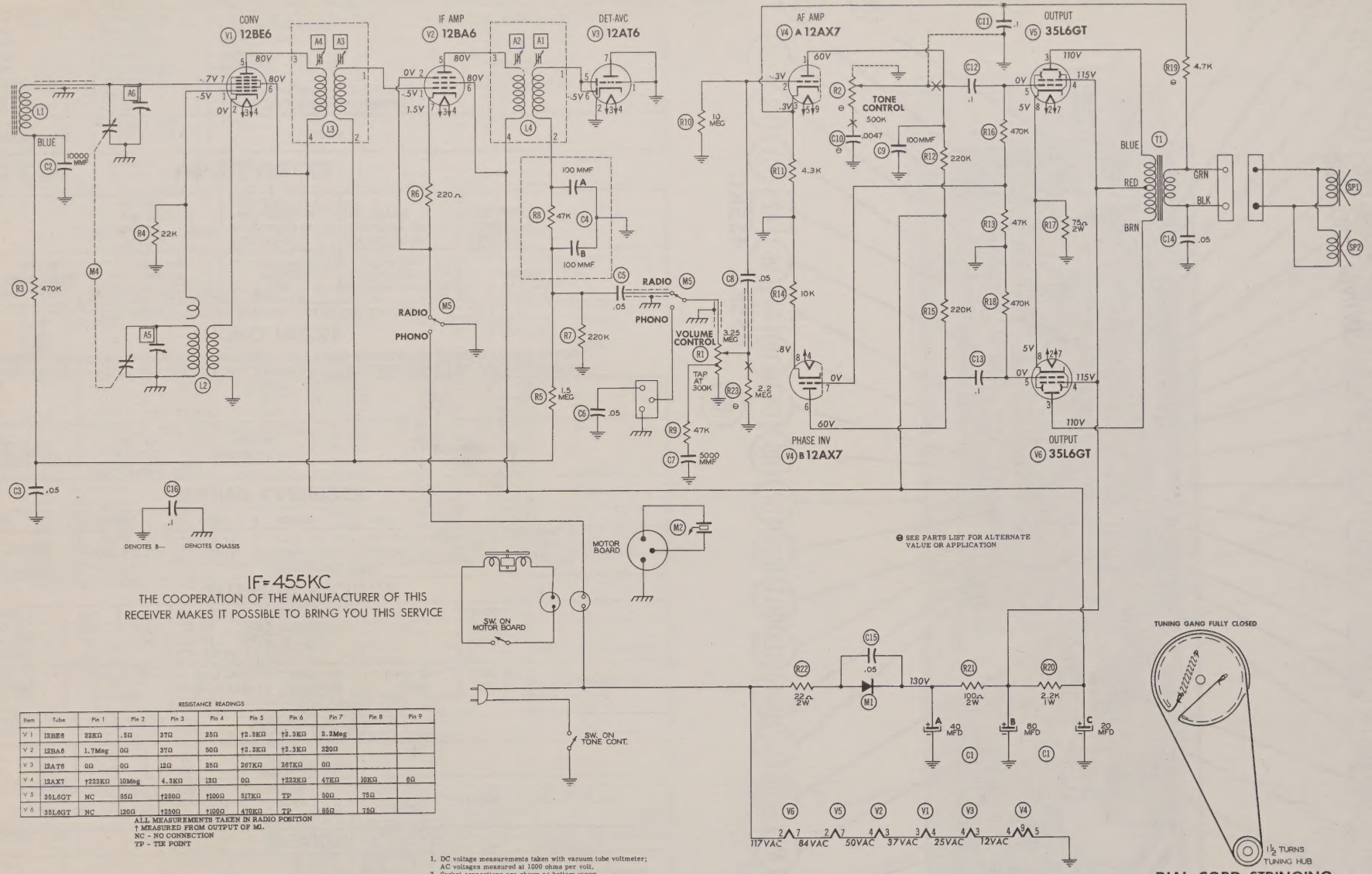
BOULDER, COLORADO

AIRCASTLE MODEL 652, 5X5



IF=455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	12BE6	22KΩ	.5Ω	37Ω	25Ω	†2.3KΩ	†2.3KΩ	2.2Meg		
V 2	12BA6	1.7Meg	0Ω	37Ω	50Ω	†2.3KΩ	†2.3KΩ	220Ω		
V 3	12AT6	0Ω	0Ω	12Ω	25Ω	267KΩ	267KΩ	0Ω		
V 4	12AX7	†222KΩ	10Meg	4.3KΩ	12Ω	0Ω	†232KΩ	47KΩ	10KΩ	6Ω
V 5	35L6GT	NC	85Ω	†250Ω	†100Ω	517KΩ	TP	50Ω	75Ω	
V 6	35L6GT	NC	120Ω	†250Ω	†100Ω	470KΩ	TP	85Ω	75Ω	

ALL MEASUREMENTS TAKEN IN RADIO POSITION
† MEASURED FROM OUTPUT OF M1.
NC - NO CONNECTION
TP - TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

TUNING GANG FULLY CLOSED

1½ TURNS TUNING HUB

DIAL CORD STRINGING

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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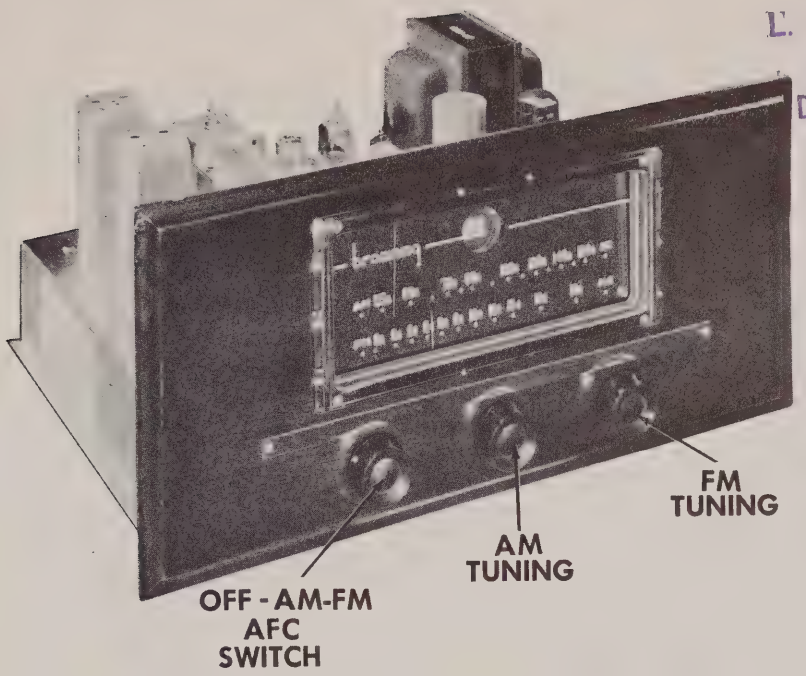
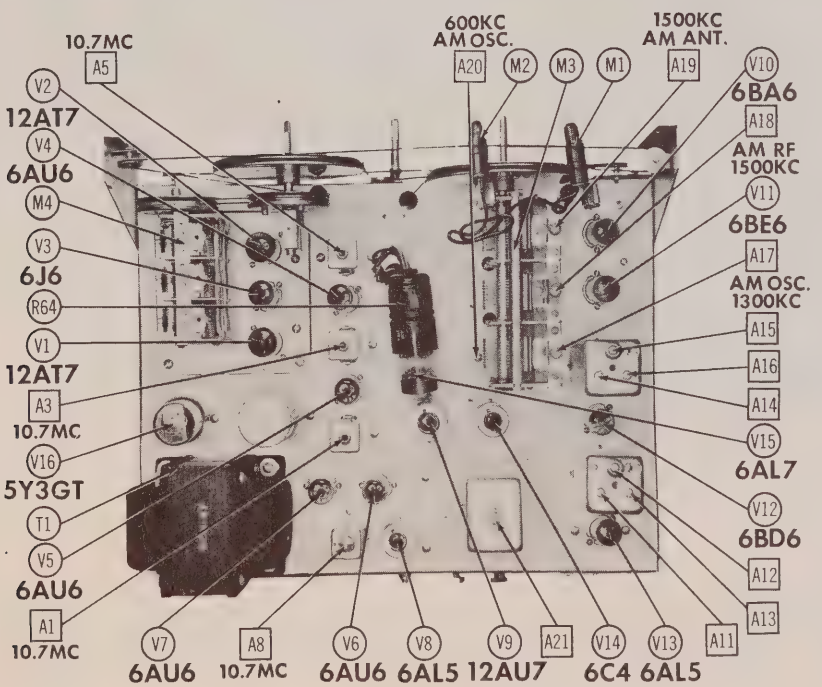


BROWNING
MODEL RJ-49

TRADE NAME	Browning Model RJ-49
MANUFACTURER	Browning Laboratories, Inc., Winchester, Mass.
TYPE SET	AC Operated AM-FM Superheterodyne Receiver For Custom Installation
TUBES	Sixteen
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 1.74 Amp. @ 117 Volts AC



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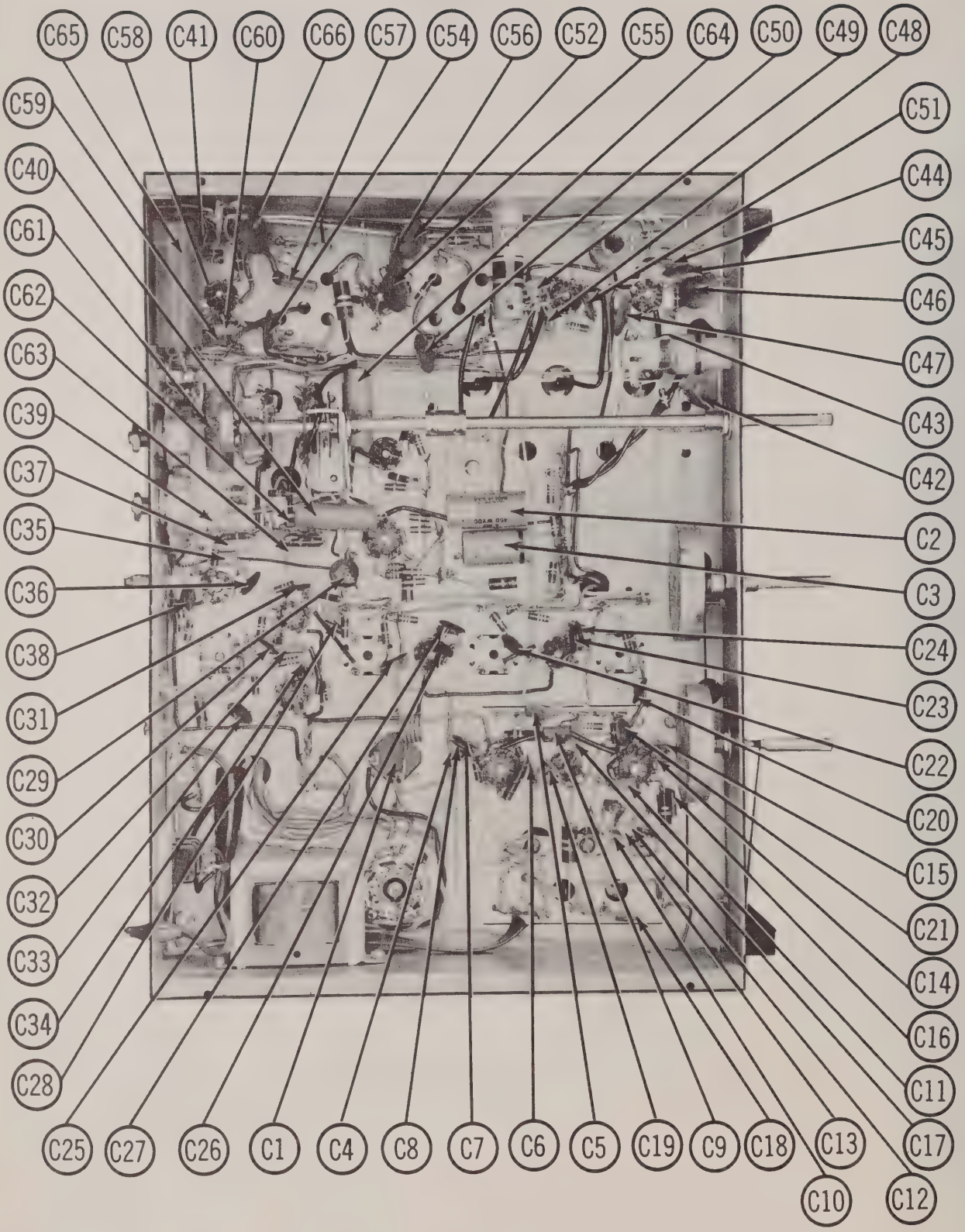
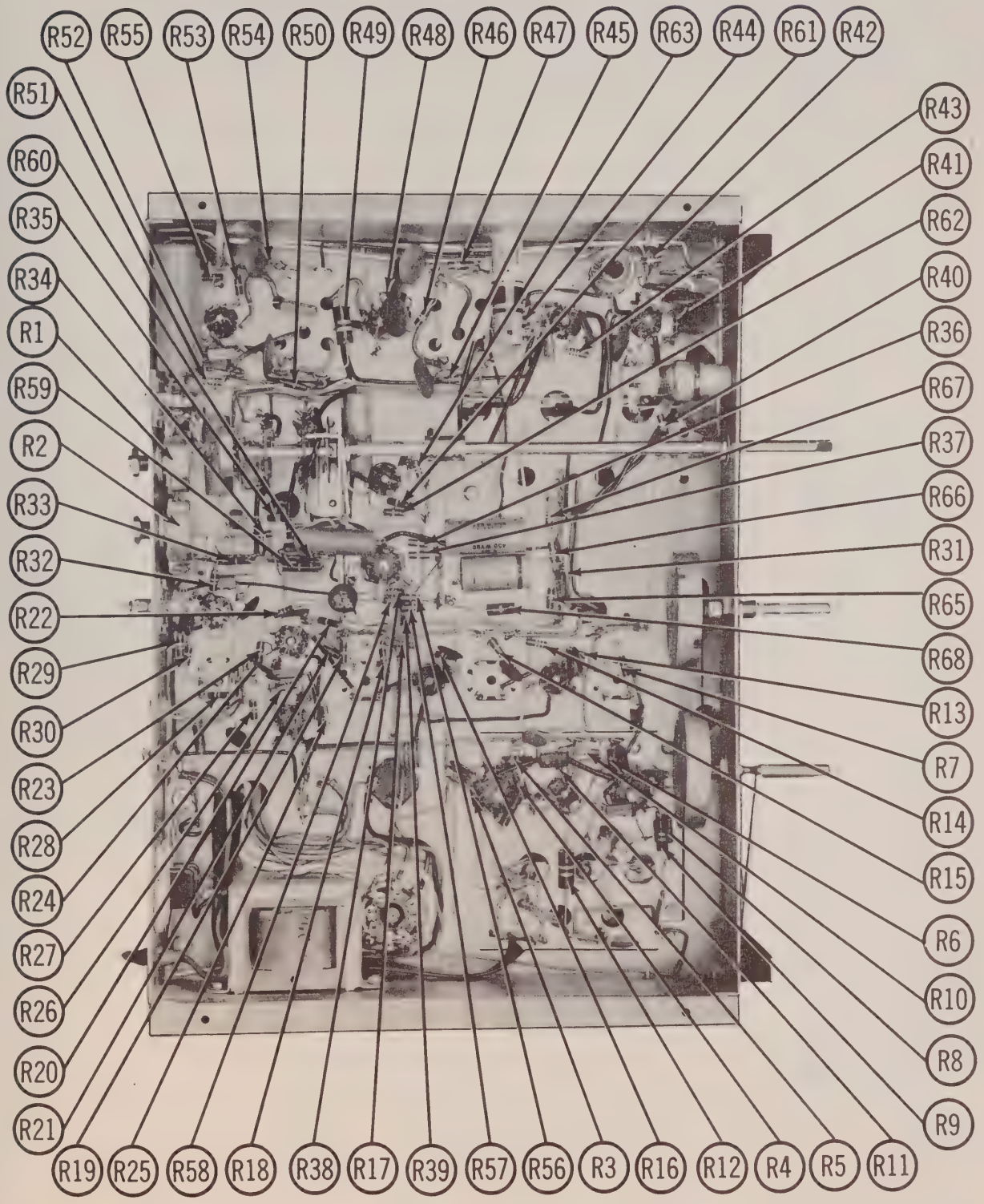
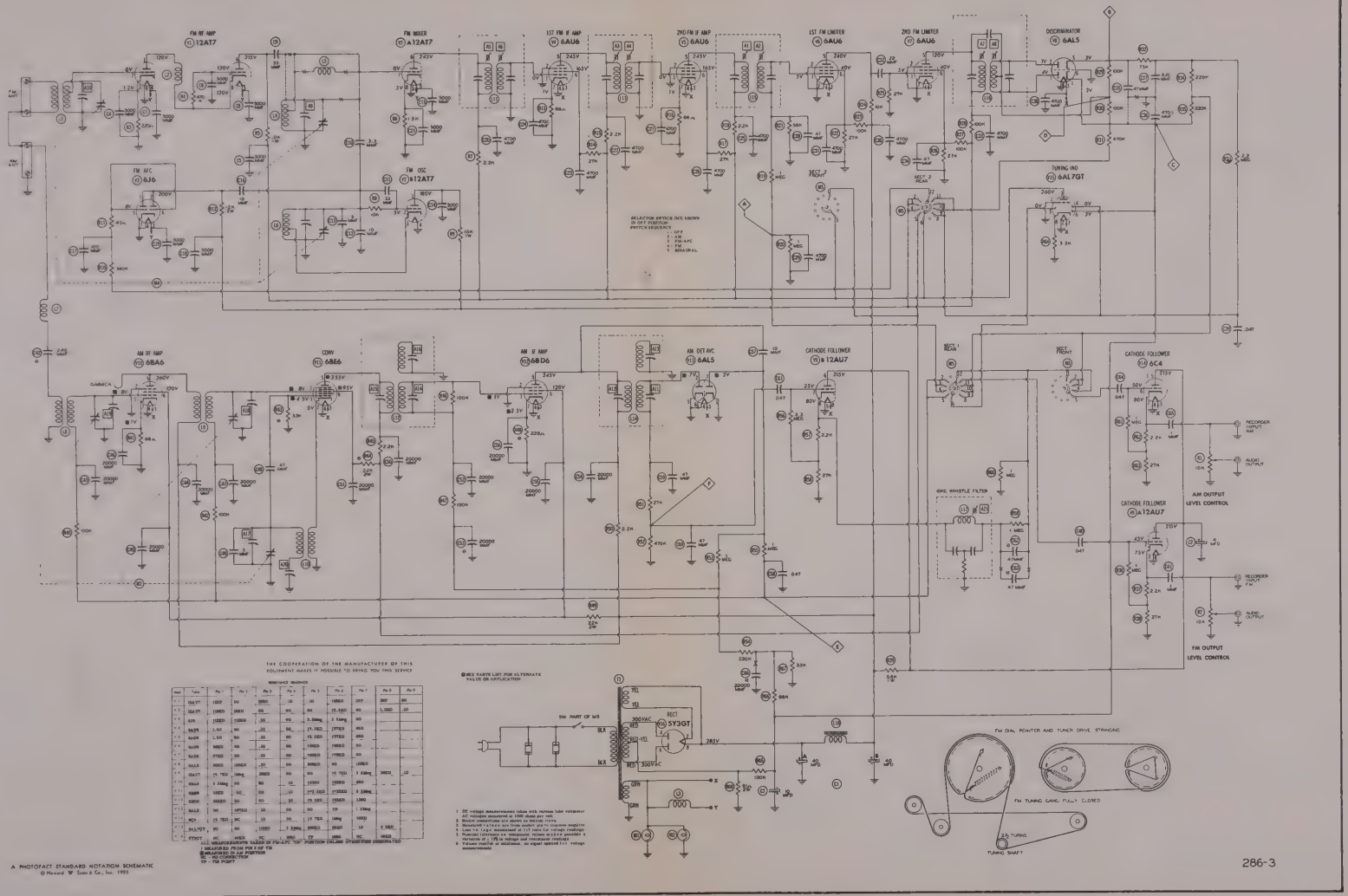


CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

4 MEADE ST
DENVER, COLORADO



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION


FM RF AMP V1 12AT7
FM MIXER V2 12AT7
1ST FM IF AMP V4 6AU6
2ND FM IF AMP V5 6AU6
1ST FM LIMITER V6 6AU6
2ND FM LIMITER V7 6AU6
DISCRIMINATOR V8 6AL5
FM AFC V3 6J6
FM OSC V2 12AT7
TUNING IND V11 6AL7GT
AM RF AMP V12 6BA6
CONV V11 6BE6
AM IF AMP V13 6BD6
AM DET AVC V11 6AL5
CATHODE FOLLOWER V15 12AU7
CATHODE FOLLOWER V16 6C4
CATHODE FOLLOWER V9 12AU7
10KC WHISTLE FILTER
AM OUTPUT LEVEL CONTROL
FM OUTPUT LEVEL CONTROL
RECORDER INPUT AM
RECORDER INPUT FM
AUDIO OUTPUT
SELECTOR SWITCH (AS SHOWN IN OFF POSITION)
SWITCH SEQUENCE
1 - OFF
2 - AM
3 - FM-AFC
4 - FM
5 - PHONO-AM
SW PART OF M5
RECT V10 5Y3GT
300VAC
280VAC
FM DIAL POINTER AND TUNER DRIVE STRINGING
FM TUNING GANG FULLY CLOSED
2½ TURNS
TUNING SHAFT
THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE
ALL MEASUREMENTS TAKEN ON FM-AFC "ON" POSITION UNLESS OTHERWISE INDICATED
M - MEASURED FROM PIN 3 OF TB
NR - NO READING OBTAINED
NC - NO CONNECTION
TP - TIE POINT
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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286-3

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

With AM and FM tuning gang capacitors fully closed, set AM and FM dial pointers to last reference marks at low frequency ends of dial scales.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1	.1MFD	High side to pin 7 (grid) of 12AT7 (V2A). Low side to chassis.	10.7MC (Unmod.)	FM	Point of non-interference.	DC probe to point (A). Common to chassis.	A1, A2, A3, A4, A5, A6	Attenuate generator output to maintain approximately 5 volts at VTVM. Adjust for maximum deflection. Adjust signal generator in steps of 25KC above and below 10.7MC. Deflection at VTVM should remain nearly constant up to 75KC above and below 10.7MC. If necessary, retouch A1 thru A6 until this condition is obtained.
2	"	"	10.7MC	"	"	DC probe to point (B). Common to point C.	A8	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
3	"	"	"	"	"	DC probe to point (D). Common to point C.	A7	Adjust for maximum deflection. Adjust generator 100KC above and below 10.7MC. Deflection at VTVM should be equal and of opposite polarity. Repeat steps 2 and 3 until this condition is obtained.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60~ modulation and 450KC sweep. Use 120~ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
1.	.01MFD	High side to pin 7 (grid) of 12AT7 (V2A) Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point (A). Low side to chassis.	A1, A2, A3, A4, A5, A6	Adjust for response curve of maximum amplitude and symmetry similar to Fig. 1. Use only enough sweep generator output to provide usable indication on scope.
2.	"	"	"	"	"	Vert. Amp. to point (B). Low side to chassis.	A7, A8	Adjust A8 so that 10.7MC occurs at center of crossover lines as in Fig. 2. Adjust A7 for maximum amplitude and straightness of crossover lines. Continue alignment with step 4.

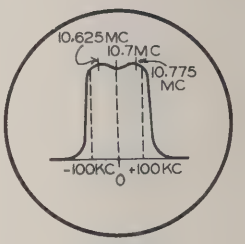


FIG. 1

FM RF ALIGNMENT

Set VTVM to 5 Volt scale.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4	Two 120Ω carbon resistors.	Across FM antenna terminals with 120Ω in each lead.	108MC (Unmod.)	FM	108MC	DC probe to point (A). Common to chassis.	L4	Adjust for maximum deflection by compressing or expanding coil turns of L4.
5	"	"	88MC	"	88MC	"		Adjust for maximum deflection by bending FM oscillator rotor plates on FM tuning gang (section nearest panel).
6	"	"	108MC	"	108MC	"	A9	Adjust for maximum deflection. Repeat steps 4 and 6 until maximum deflection is obtained at 108MC.
7	"	"	88MC	"	88MC	"		Insert both ends of tuning wand in L3. If brass end of wand increases deflection on VTVM, slightly spread FM oscillator plates. If iron end of wand increases deflection on VTVM, slightly compress the FM oscillator plates. Continue this procedure in small steps until maximum deflection is obtained.
8	"	"	108MC	"	Tune to 108MC signal.	"	A10	Adjust for maximum deflection.

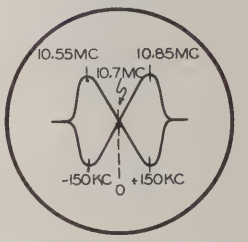


FIG. 2

AM ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
9.	.01MFD	High side to pin 7 (grid) of 6BE6 (V11). Low side to chassis.	455KC (Unmod)	AM	Tuning gang fully open	DC probe to point (B). Common to chassis.	A11, A12, A13, A14 A15, A16	Adjust for maximum deflection. Vary signal generator from 453KC to 457KC and note VTVM deflection. The deflection should be approximately the same if response is symmetrical. If necessary, retouch A11 thru A16 until this condition is obtained.
10.	Direct	High side to ungrounded AM antenna terminal. Low side to chassis.	1300KC (Unmod)	"	1300KC	"	A17	Adjust for maximum deflection.
11.	"	"	1500KC	"	Tune to 1500KC signal	"	A18, A19	"
12.	"	"	600KC	"	600KC	"	A20	Adjust for maximum deflection. Repeat steps 10 and 11.
13.	Connect AM antenna to tuner and tune in a station between 1500 and 1600KC and adjust A19 for maximum deflection.							
14.	.01MFD	High side to point (F). Low side to chassis.	10KC	AM	Tuning gang fully open	Use OUTPUT METER Across AM audio output jack (rear panel)	A21	Adjust for MINIMUM output.

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

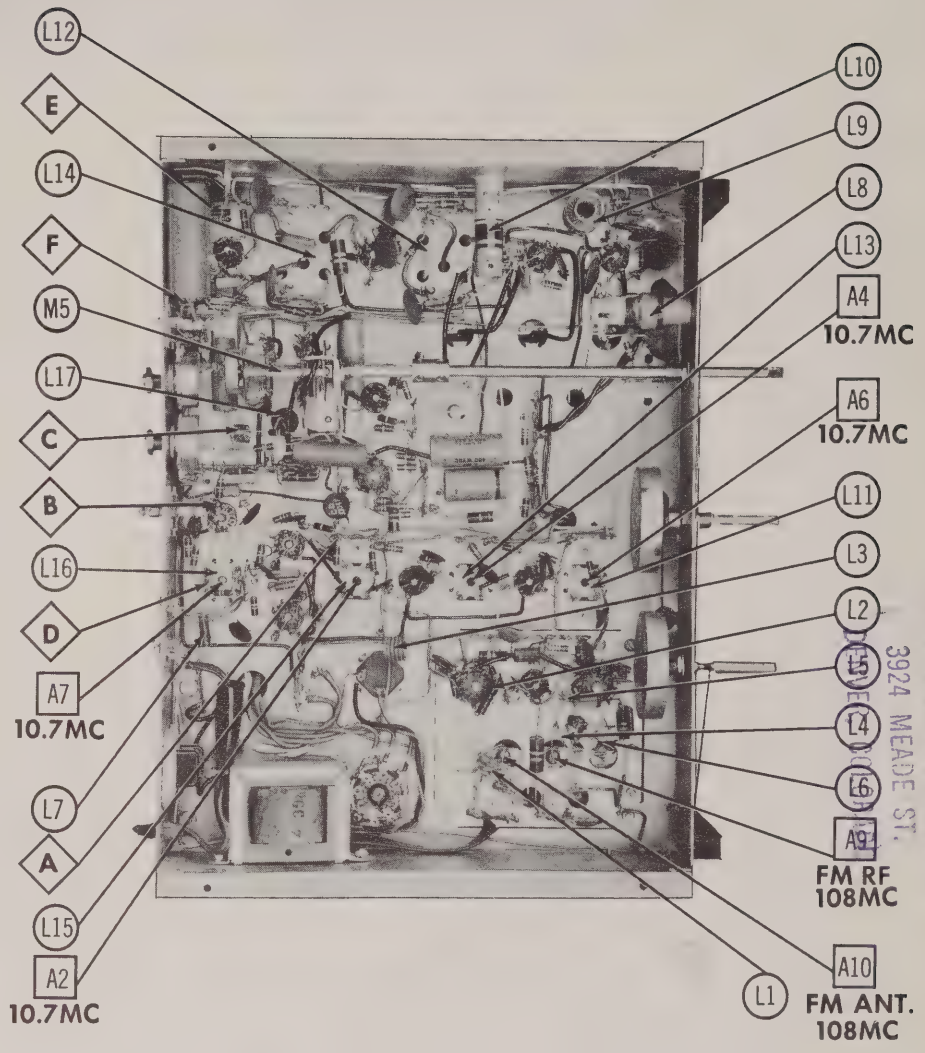
ITEM No.	USE	REPLACEMENT DATA		RETMA BASE TYPE	NOTES
		BROWNING PART No.	STANDARD REPLACEMENT		
V1	FM RF Amp.	12AT7	12AT7	9A	
V2	FM Mixer-Osc.	12AT7	12AT7	9A	
V3	FM AFC	6J6	6J6	7BF	
V4	1st. FM IF Amp.	6AU6	6AU6	7BK	
V5	2nd. FM IF Amp.	6AU6	6AU6	7BK	
V6	1st. AM Limiter	6AU6	6AU6	7BK	
V7	2nd. FM Limiter	6AU6	6AU6	7BK	
V8	Discriminator	6AL5	6AL5	6BT	
V9	Cathode Follower-AM Cath. Follower	12AU7	12AU7	9A	
V10	AM RF Amp.	6BA6	6BA6	7BK	
V11	AM Converter	6BE6	6BE6	7CH	
V12	AM IF Amp.	6BD6	6BD6	7CK	
V13	AM Det.-AVC	6AL5	6AL5	6BT	
V14	Cath. Follower	6C4	6C4	6BG	
V15	Tuning Indicator	6AL7GT	6AL7GT	8CH	
V16	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT	BROWNING PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	40 ■	450				FP238	TM-D40-450	D-235	
B	40 ▪	450							
C2	4	450				TC70	TD-4-450	FM-4504	
C3	10	25				TC22	TD-10-25	FM-0210	
C4	5000			DD-502	811-005	DC-525		C-1250	
C5	5000			DD-502	811-005	DC-525		C-1250	
C6	5000			DD-502	811-005	DC-525		C-1250	
C7	5000			DD-502	811-005	DC-525		C-1250	
C8	5000			DD-502	811-005	DC-525		C-1250	
C9	33	500		TCZ-33	NP0L-330	ZT-5433		KR-1433	
C10	3.3			TCZ-3R3	NP0A-3R3	ZT-5533			
C11	33	500		TCZ-33	NP0L-330	ZT-5433		KR-1433	
C12	10								
C13	5			TCN-5	N750A-050				
C14	5000			DD-502	811-005	DC-525		C-1250	
C15	5000			DD-502	811-005	DC-525		C-1250	
C16	10	500		TCZ-10	NP0A-100	MCB215		KR-1410	
C17	100	500		TCZ-100	NP0-337-101	MCB235		KR-1310	
C18	5000			DD-502	811-005	DC-525		C-1250	
C19	5000			DD-502	811-005	DC-525		C-1250	
C20	4700			DD-472	811-0047	DC-525		C-1247	
C21	5000			DD-502	811-005	DC-525		C-1250	
C22	4700			DD-472	811-0047	DC-525		C-1247	
C23	4700			DD-472	811-0047	DC-525		C-1247	
C24	4700			DD-472	811-0047	DC-525		C-1247	
C25	4700			DD-472	811-0047	DC-525		C-1247	
C26	4700			DD-472	811-0047	DC-525		C-1247	
C27	4700			DD-472	811-0047	DC-525		C-1247	
C28	47	500		TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C29	4700			DD-472	811-0047	DC-525		C-1247	
C30	4700			DD-472	811-0047	DC-525		C-1247	
C31	4700			DD-472	811-0047	DC-525		C-1247	
C32	22	500		TCZ-22	NP0K-220			KR-1422	
C33	4700			DD-472	811-0047	DC-525		C-1247	
C34	47	500		TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C35	47	500		TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C36	4700			DD-472	811-0047	DC-525		C-1247	
C37	620	500						KR-1362	
C38	4700			DD-472	811-0047	DC-525		C-1247	
C39	.047	200		DF-503		PT4147	IMP2-S47	3302147	
C40	.047	600		DF-503		PT6147	IMP6-S47	3306147	
C41	1	200				AG452	CT2-1	330210	
C42	240	500		TCZ-240	NP0-335-241			K-1324	Note 1
C43	20000			DD-203	817-02				
C44	20000			DD-203	817-02				
C45	20000			DD-203	817-02				
C46	20000			DD-203	817-02				

CHASSIS—BOTTOM VIEW



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3924 MEADE ST.

PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA BROWNING PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C47	20000			DD-203	817-02				
C48	47	500		TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C49	5	500			NP0A-050	ZT-555		KR-1550	
C50	20000			DD-203	817-02				
C51	20000			DD-203	817-02				
C52	20000			DD-203	817-02				
C53	20000			DD-203	817-02				Note 2
C54	20000			DD-203	817-02				
C55	20000			DD-203	817-02				
C56	20000			DD-203	817-02				
C57	10	500		TCZ-10	NP0A-100	MCB215		KR-1510	
C58	.047	600		DF-503		PT6147	IMP6-S47	3306147	
C59	47	500		TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C60	47	500		TCZ-47	NP0-338-470	ZT-5447		KR-1447	
C61	.047	600		DF-503		PT6147	IMP6-S47	3306147	
C62	47			TCZ-47	NP0-338-470	ZT-5447		KR-1447	Note 3
C63	47			TCZ-47	NP0-338-470	ZT-5447		KR-1447	Note 3
C64	.047	600		DF-503		PT6147	IMP6-S47	3306147	
C65	1	200				AG452	CT2-1	330210	
C66	20000			DD-203	811-02				Note 2

Note 1. Some versions may use a 220MMF capacitor in this application.
Note 2. Not used in some versions.
Note 3. When C60 is 100MMF, C61 is not used.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA BROWNING PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	10KΩ	½	SX-1931	Q11-116	A47-10K-S	AB-14	SU-20	AM Output Level Set
B	Shaft		Not Req.	SQ	FKS-1/4	AK-1	Not Req.	Attach to R1A
R2A	10KΩ	½	SX-1931	Q11-116	A47-10K-S	AB-14	SU-20	FM Output Level Set
B	Shaft		Not Req.	SQ	FKS-1/4	AK-1	Not Req.	Attach to R2A

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA BROWNING PART No.	IRC PART No.	NOTES
R3	220Ω	½		BTS-220	
R4	470KΩ	½		BTS-470K	
R5	10KΩ	1		BTA-10K	
R6	1500Ω	½		BTS-1500	
R7	2200Ω	½		BTS-2200	
R8	10KΩ	½		BTS-10K	
R9	10KΩ	1		BTA-10K	
R10	390KΩ	½		BTS-390K	
R11	47Ω	½		BTS-47	
R12	12KΩ	2		BTB-12K	
R13	68Ω	½		BTS-68	
R14	27KΩ	½		BTS-27K	
R15	2200Ω	½		BTS-2200	
R16	68Ω	½		BTS-68	
R17	27KΩ	½		BTS-27K	
R18	2200Ω	½		BTS-2200	
R19	1Meg	½		BTS-1Meg	
R20	1Meg	½		BTS-1Meg	
R21	56KΩ	½		BTS-56K	
R22	27KΩ	½		BTS-27K	
R23	100KΩ	½		BTS-100K	
R24	10KΩ	½		BTS-10K	
R25	27KΩ	½		BTS-27K	
R26	27KΩ	½		BTS-27K	
R27	100KΩ	½		BTS-100K	
R28	100KΩ	½		BTS-100K	
R29	100KΩ	½		BTS-100K	
R30	100KΩ	½		BTS-100K	
R31	470KΩ	½		BTS-470K	
R32	75KΩ 5%	½		BTS-75K 5%	
R33	2.2Meg	½		BTS-2.2Meg	Note 1
R34	220KΩ	½		BTS-220K	
R35	220KΩ	½		BTS-220K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA BROWNING PART No.	IRC PART No.	NOTES
R36	1Meg	½		BTS-1Meg	
R37	2200Ω	½		BTS-2200	
R38	27KΩ	½		BTS-27K	
R39	5600 Ω	1		BTA-5600	
R40	100KΩ	½		BTS-100K	
R41	68Ω	½		BTS-68	
R42	100KΩ	½		BTS-100K	
R43	33KΩ	½		BTS-33K	Note 2
R44	22KΩ	2		BTB-22K	Note 1
R45	2200Ω	½		BTS-2200	
R46	100KΩ	½		BTS-100K	
R47	100KΩ	½		BTS-100K	
R48	220Ω	½		BTS-220	Note 3
R49	22KΩ	2		BTB-22K	
R50	2200Ω	½		BTS-2200	
R51	27KΩ	½		BTS-27K	
R52	470KΩ	½		BTS-470K	
R53	1Meg	½		BTS-1Meg	
R54	220KΩ	½		BTS-220K	
R55	1Meg	½		BTS-1Meg	
R56	3.3Meg	½		BTS-3.3Meg	
R57	2200Ω	½		BTS-2200	
R58	27KΩ	½		BTS-27K	
R59	1Meg	½		BTS-1Meg	
R60	1Meg	½		BTS-1Meg	
R61	1Meg	½		BTS-1Meg	
R62	2200Ω	½		BTS-2200	
R63	27KΩ	½		BTS-27K	
R64	3300Ω	½		BTS-3300	
R65	100KΩ	½		BTS-100K	
R66	68KΩ	½		BTS-68K	
R67	33KΩ	½		BTS-33K	
R68	91Ω 5%	2			

Note 1. Some versions use a 2200Ω resistor in this application.
Note 2. Some versions use a 27KΩ resistor in this application.
Note 3. Some versions use a 240Ω resistor in this application.

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	REPLACEMENT DATA BROWNING PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @.74A	560VCT .086ADC	5VAC @ 2A	6.3VAC @4.4A		P9312 ①②		PC-8405①②	22R05 ①	R-12A ①②

① Drill new mounting holes.
② Tape 6.3V center tap.

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA BROWNING PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	FM Ant.Coil	0Ω	0Ω					
L2	Input Coil	.1Ω			19-1000	TV-189	4602	1 Microhenry
L3	Fil. Choke	0Ω						
L4	FM RF Coil	0Ω						Tapped
L5	Parasitic Suppressor	0Ω						
L6	FM Osc.Coil	0Ω						Tapped
L7	AM Ant. Loading Coil	.6Ω			19-1004		4610	5 Microhenries
L8	AM Ant.Coil	4.8Ω	4.8Ω		14-1056	BC-380	72-A	
L9	AM RF Coil	85Ω	3.4Ω		14-1023	BC-413	43-RF	
L10	AM Osc.Coil	.9Ω	9.8Ω	16979-1	14-4034	BC-397	5480-C	
L11	1st.FM IF	1.2Ω	1.2Ω	16486-1	16-3487	FM-254	1463	
L12	1st.AM IF	16Ω	16Ω	14487				
L13	2nd.FM IF	1.2Ω	1.2Ω	16486-1	16-3487	FM-254	1463	
L14	2nd.AM IF	16Ω	16Ω	14488				
L15	3rd.FM IF	1.2Ω	1.2Ω	16486-1	16-3487	FM-254	1463	
L16	Discriminator	1.4Ω	1.2ΩCT	15808	17-3494	FM-253	1464	
L17	10KC Whistle Filter	120Ω						Includes cap. & resistors

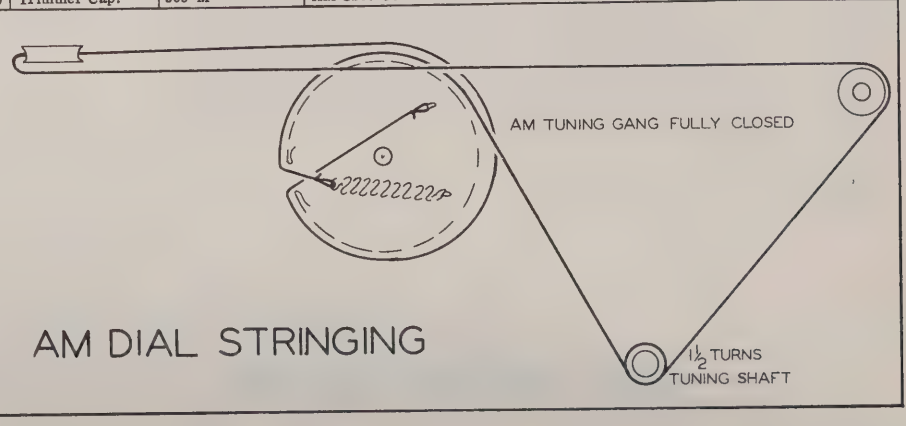
FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ~)	REPLACEMENT DATA BROWNING PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L18	.086A	154Ω	4.35 HY		C5020		C-1709	20C64 ①	C-9X

① Drill one new mounting hole.

MISCELLANEOUS

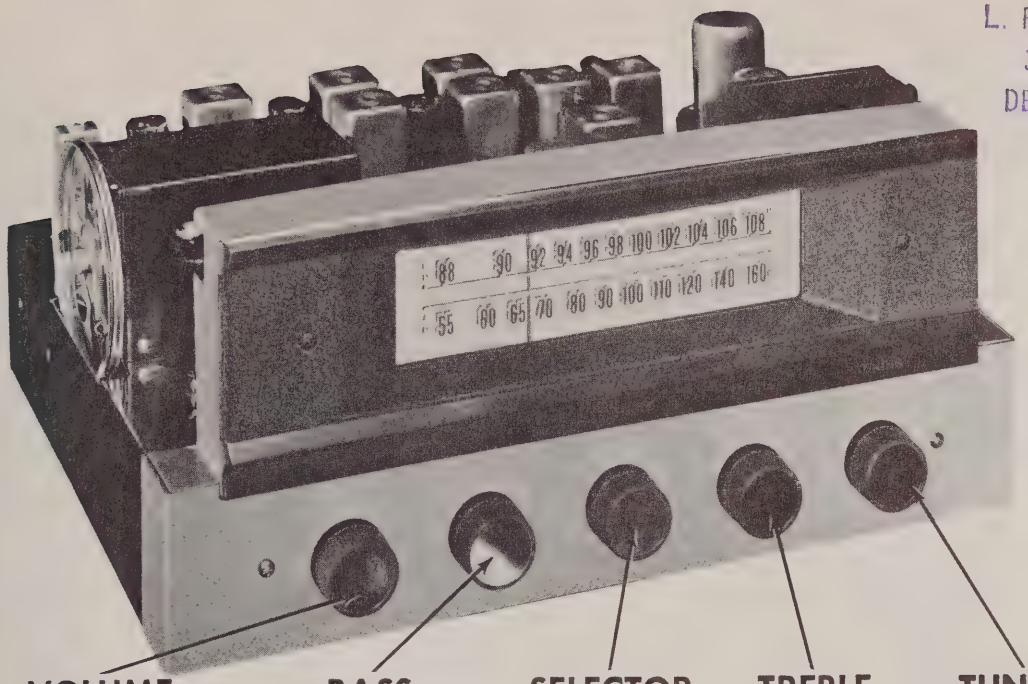
ITEM No.	PART NAME	BROWNING PART No.	NOTES
M1	Dial Light		#1830
M2	Dial Light		#1830
M3	Tuning Cap.		AM - 3 Gang (38-415MMF, 38-415MMF, 38-415MMF)
M4	Tuning Cap.		FM-3 Gang
M5	Switch		On-off & Selector
A20	Trimmer Cap.	303-M	AM Osc. Coil Padder



CRAFTSMEN MODEL C1000

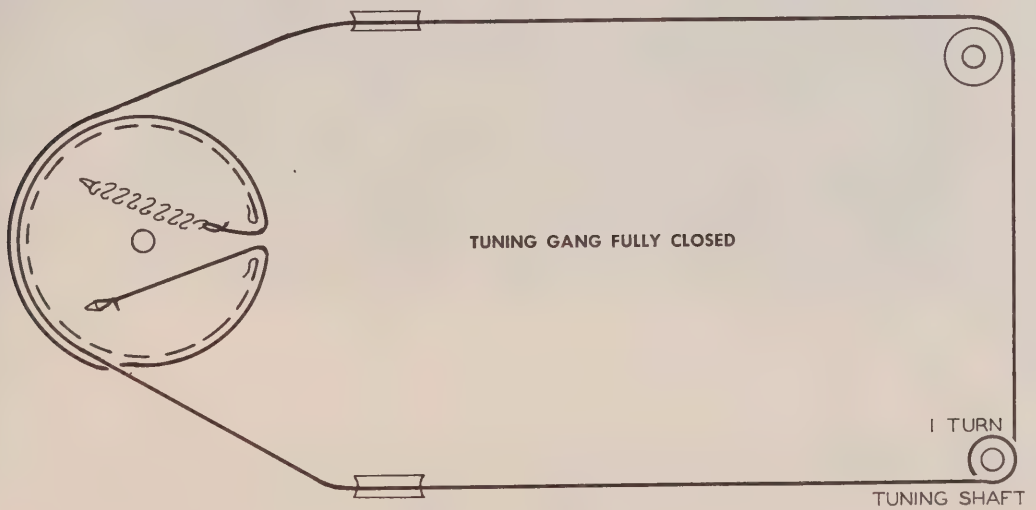
F [illegible] OF
L. F. [illegible] SHIP
3924 MERGE ST.
DENVER, COLORADO

CRAFTSMEN
MODEL C1000


88 90 92 94 96 98 100 102 104 106 108
55 60 65 70 80 90 100 110 120 140 160
VOLUME CONTROL
BASS CONTROL
SELECTOR SWITCH
TREBLE CONTROL
TUNING

CRAFTSMEN
MODEL C1000

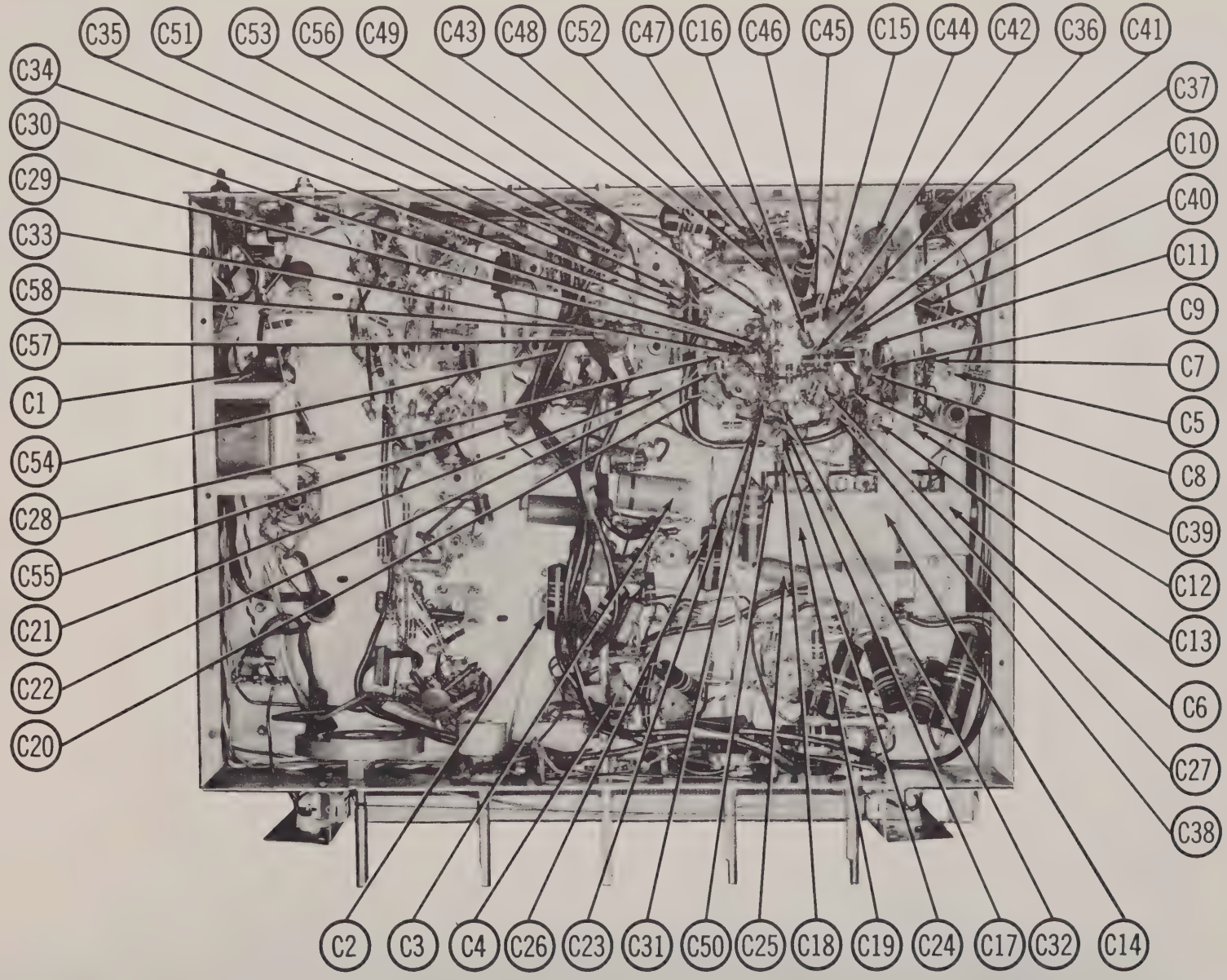
TRADE NAME	Craftsmen Model C1000	
MANUFACTURER	The Radio Craftsmen, Inc., 4401 N. Ravenswood Ave., Chicago 40, Ill.	
TYPE SET	AC Operated AM-FM Superheterodyne Tuner For Custom Installation	
TUBES	Sixteen	
POWER SUPPLY	110-120 Volts AC- 50/60 Cycles	RATING .67 Amp. @ 117 Volts AC
TUNING RANGE - BROADCAST	550KC-1700KC	FREQ. MOD. 88MC-108MC



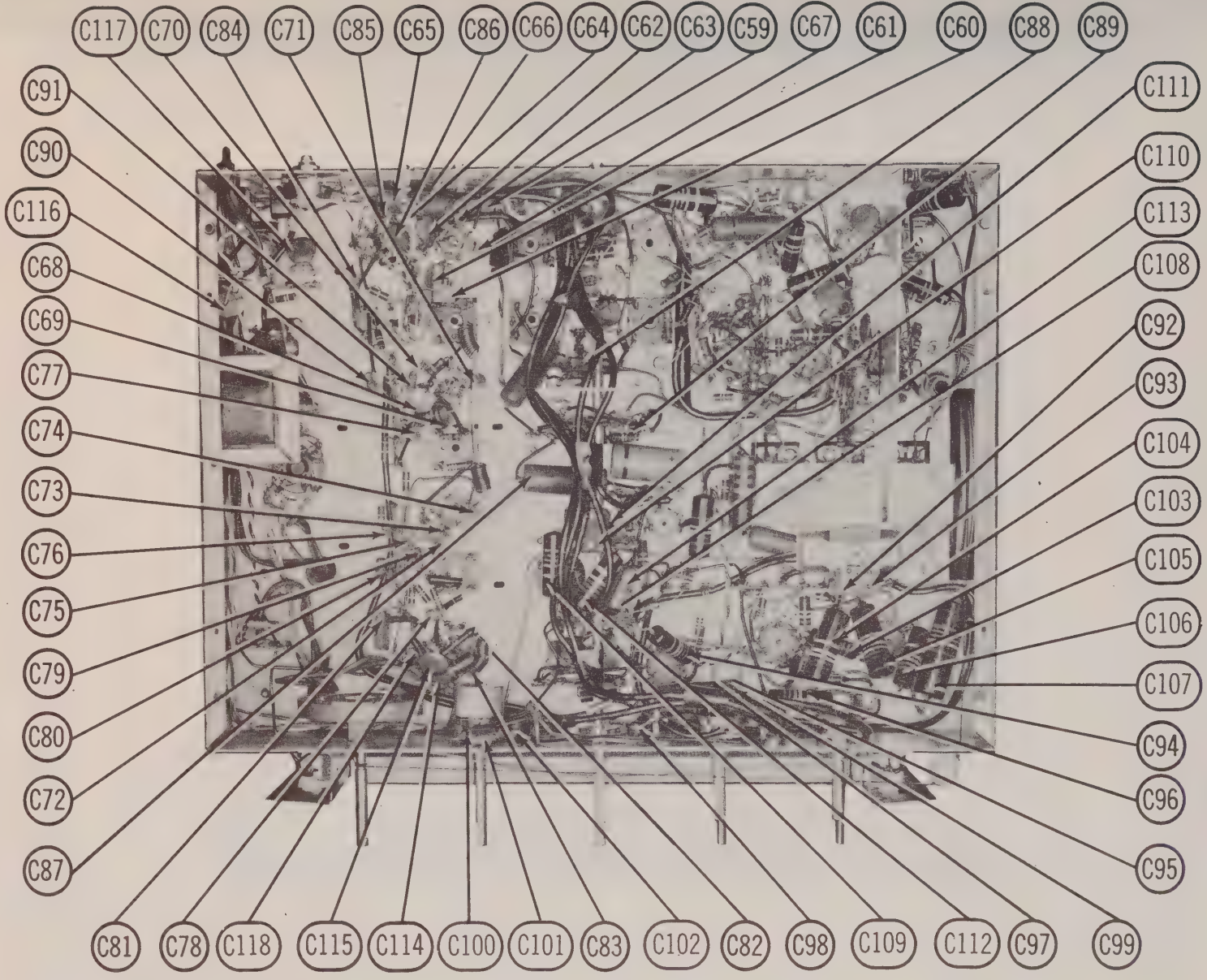
DIAL CORD STRINGING

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

"The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed." "Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. Copyright 1955 by Howard W. Sams & Co., Inc., Indianapolis 5, Indiana, U. S. of America. Copyright under International Copyright Union. All rights reserved under Inter-American Copyright Union (1910) by Howard W. Sams & Co., Inc." Printed in U. S. of America

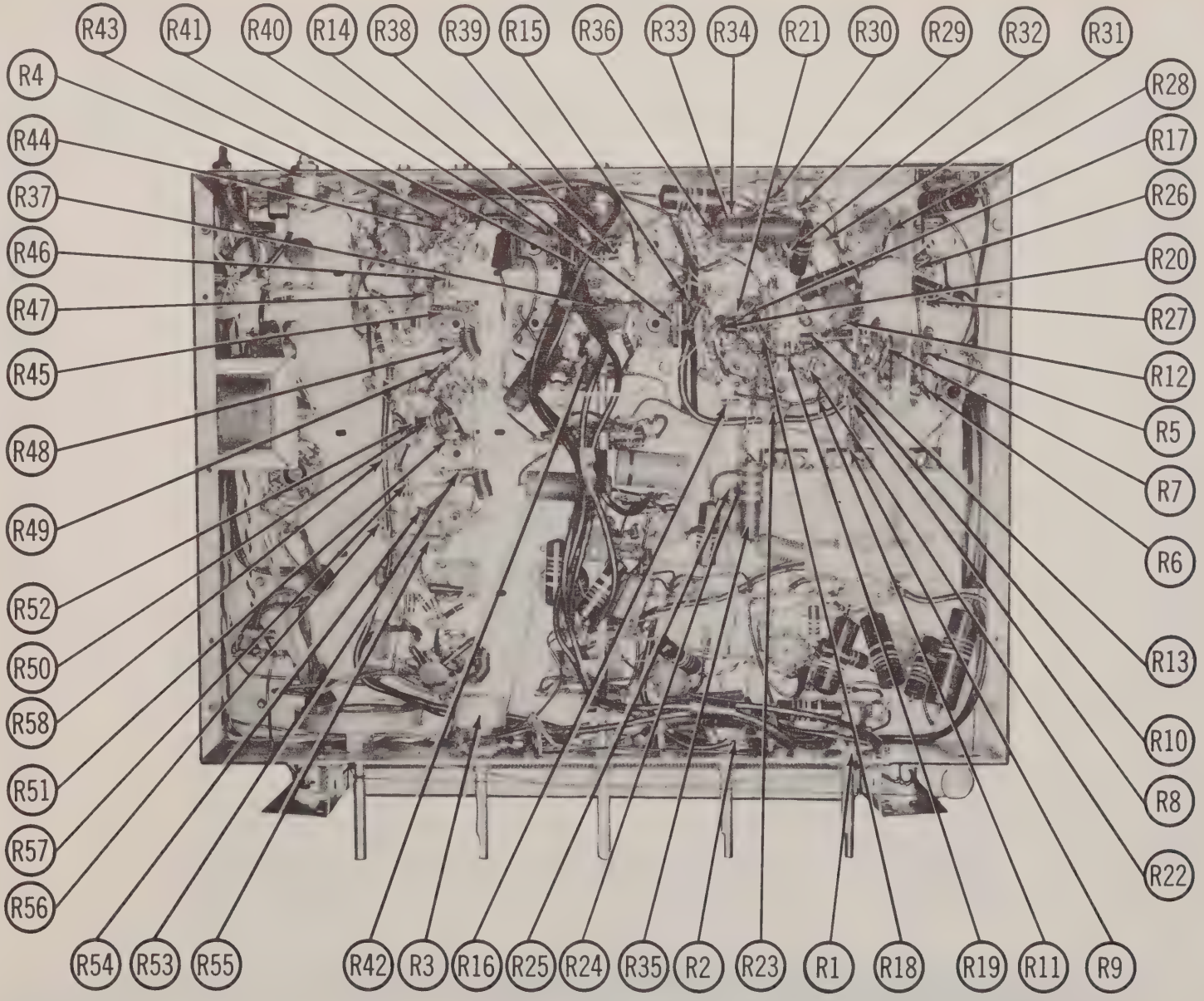


CH. BOTTOM VIEW-CAPACITOR IDENTIFICATION (C1 thru C58)

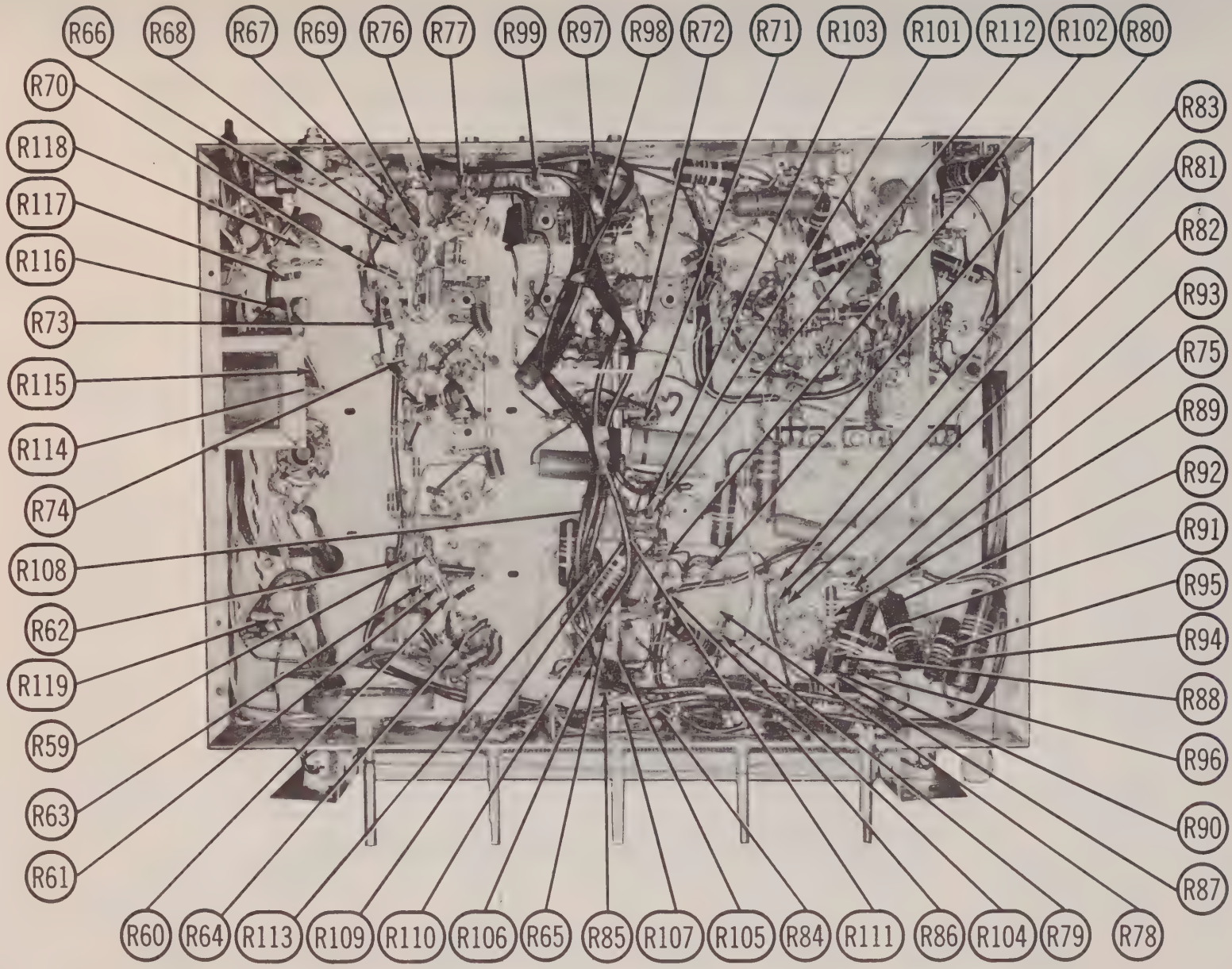


CH. BOTTOM VIEW-CAPACITOR IDENTIFICATION (C59 thru C118)

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



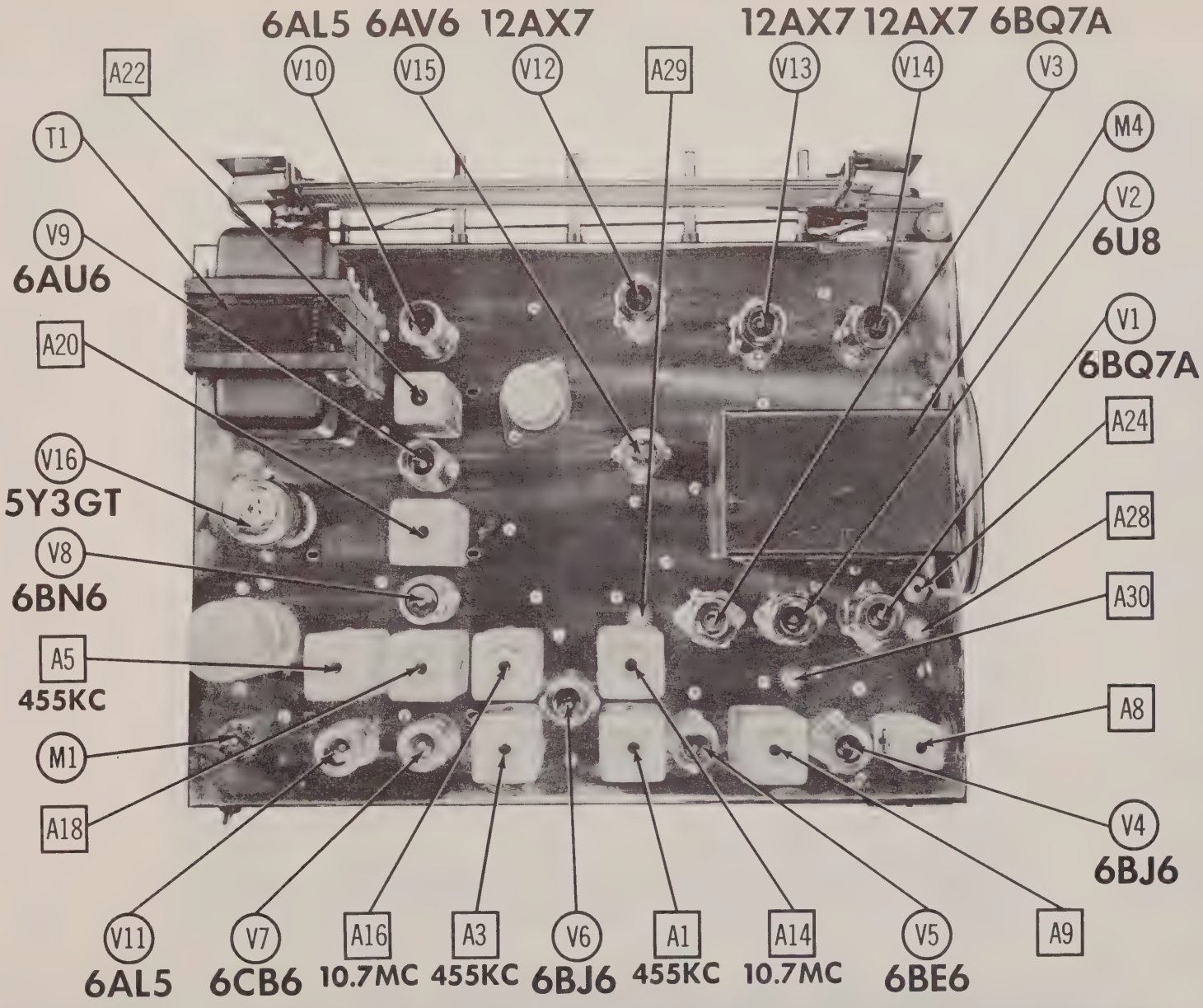
CH. BOTTOM VIEW-RESISTORS IDENTIFICATION (R1 thru R58)



CH. BOTTOM VIEW-RESISTORS IDENTIFICATION (R59 thru R119)

CRAFTSMEN
MODEL C1000

PROPE
F. BL
3924 MEDI ST.
DENVER, COLORADO



CHASSIS TOP VIEW

RC... .E ...P.
392... ...ST.
...VER, COLORADO

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading.
Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and chassis.
To set pointer, turn tuning capacitor fully closed and set pointer to last reference mark at low frequency end of dial.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
1.	.1MFD	High side to pin 1 (grid) of 6BE6 (V5). Low side to chassis.	455KC (400∿Mod)	AM (Sharp)	Point of non-interference	DC probe to point A . Common to chassis.	A1, A2, A3, A4, A5, A6	Adjust in order given for maximum deflection.
2.	200MMF	High side to AM ant. terminal. Low side to chassis.	600KC	"	600KC	"	A7, A1, A8, A9, A10, A11, A12	"
3.	"	"	1400KC	"	1400KC	"	A10, A11 A12	Adjust in order given for maximum deflection. Repeat steps 1, 2 and 3.

WHISTLE FILTER ADJUSTMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
4.		High side to AM antenna terminal. Low side to ground.	1400KC (10KC AM Mod)	AM (Broad)	1400KC	DC probe to point B . Common to chassis.	A13	Adjust for MINIMUM deflection.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
5.	.1MFD	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (Unmod)	FM (AFC off)	Point of non-interference	DC probe to point D . Common to chassis.	A14, A15 A16, A17 A18, A19 A20, A21 A22	Adjust A15 and A23 for maximum deflection, then adjust A14 thru A23 in order given for maximum deflection.
6.	"	"	"	"	"	"	A23	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting. Repeat steps 5 and 6. Proceed with step 8.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
5.	.1MFD	High side to pin 2 (grid) of 6U8 (V2). Low side to chassis.	10.7MC (450KC Swp)	FM (AFC off)	Point of non-interference	Vert. Amp. to point B . Low side to chassis.	A14, A15, A16, A17, A18, A19, A20, A21,	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
6.	"	"	"	"	"	Vert. Amp. to point E . Low side to chassis.	A22	"
7.	"	"	"	"	"	Vert. Amp. to point F . Low side to chassis.	A23	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A22 for maximum amplitude and straightness of crossover lines.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
8.	Two 120Ω Carbon Resistors	Across FM antenna terminals with 120Ω in each lead.	88MC	FM (AFC off)	88	DC probe to point E . Common to chassis.	A24, L4, L6	Adjust A24 and expand or compress L4 and L6 for maximum deflection.
9.	"	"	106MC	"	106MC	"	A25, A26, A27	Adjust for maximum deflection.
10.	"	"	"	"	"	"	A28, A29, A30	If necessary adjust A28, A29 and A30 for proper tracking.

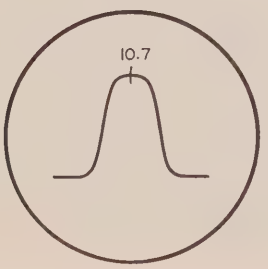
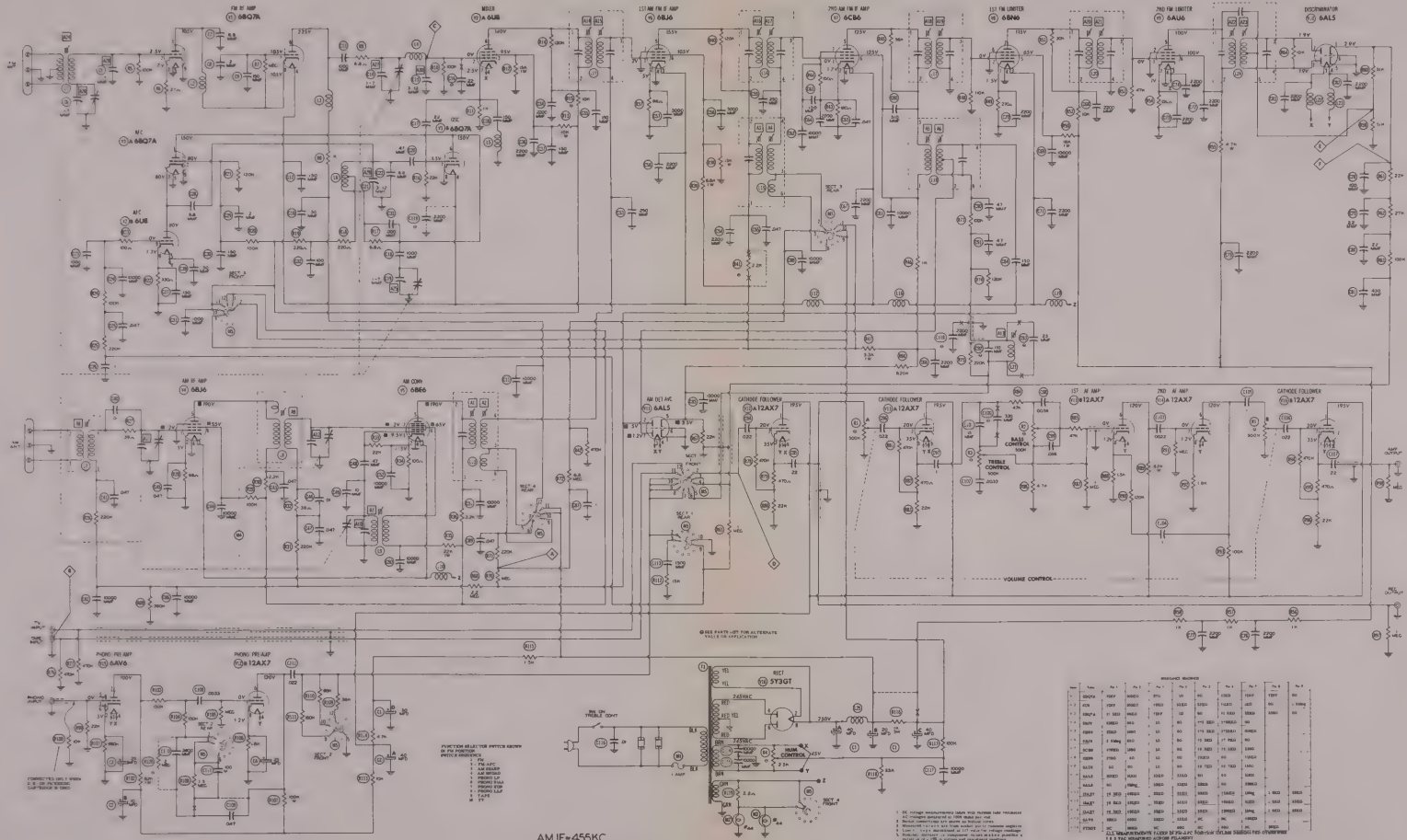


FIG. 1

FIG. 2



A PHOTOFACT STANDARD NOTATION SCHEMATIC
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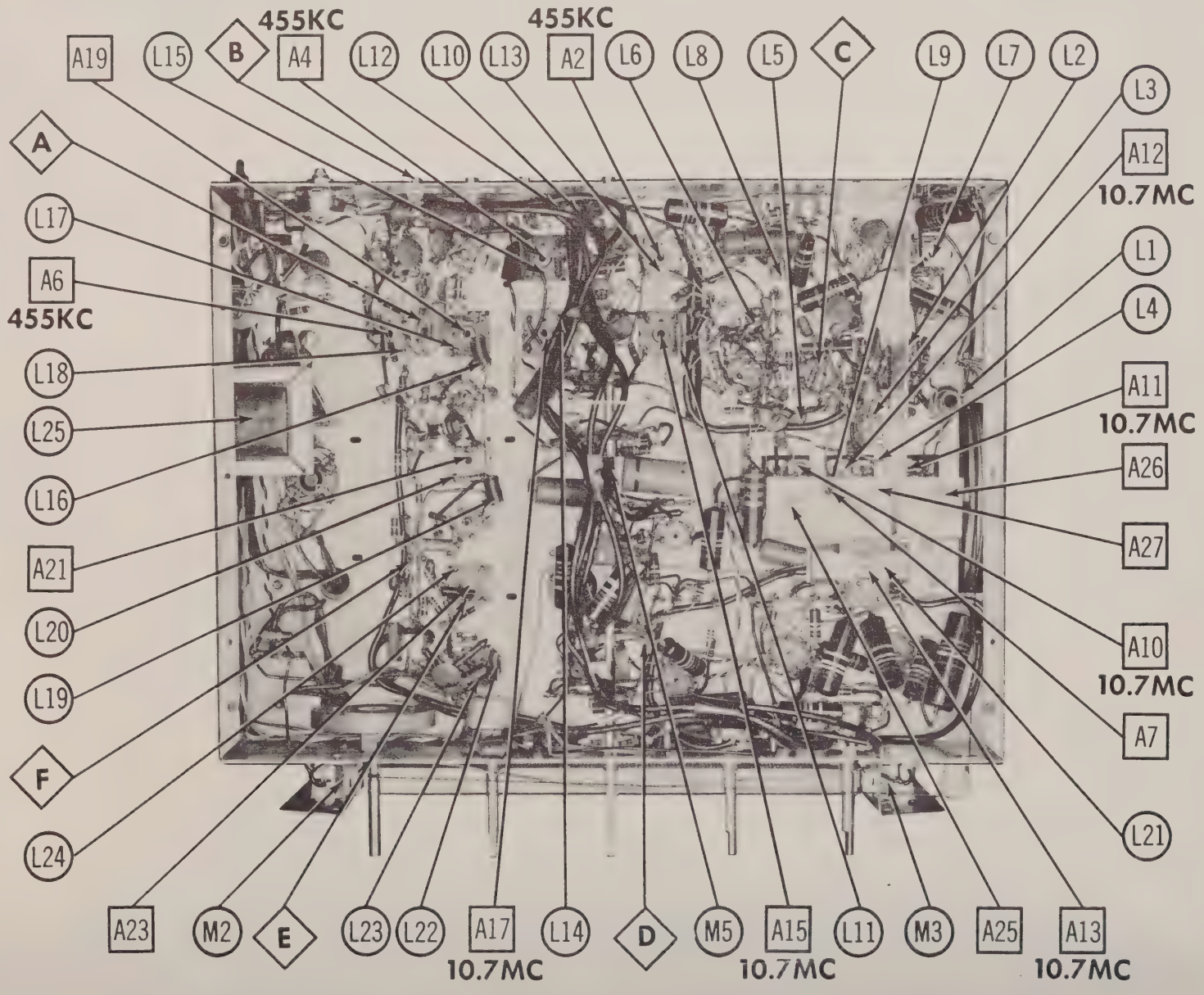

CH. BOTTOM VIEW - INDUCTOR AND ALIGNMENT IDENTIFICATION

PARTS LIST AND DESCRIPTIONS
TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: CRAFTSMEN PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	FM RF Amp.	6BQ7A	6BQ7A	9AJ	6BK7A used as alternate
V2	FM Mixer-AFC	6U8	6U8	9AE	
V3	FM Osc.-AFC	6BQ7A	6BQ7A	9AJ	6BK7A used as alternate
V4	AM RF Amp.	6BJ6	6BJ6	7CM	
V5	AM Converter	6BE6	6BE6	7CH	
V6	1st. AM-FM IF Amp.	6BJ6	6BJ6	7CM	
V7	2nd. AM-FM IF Amp.	6CB6	6CB6	7CM	
V8	1st. FM Limiter	6BN6	6BN6	7DF	
V9	2nd. FM Limiter	6AU6	6AU6	7BK	
V10	Discriminator	6AL5	6AL5	6BT	
V11	AM Det.-AVC	6AL5	6AL5	6BT	
V12	Cathode Follower-Phono Pre-Amp.	12AX7	12AX7	9A	
V13	Cathode Follower-1st. AF Amp.	12AX7	12AX7	9A	
V14	2nd. AF Amp.-Cathode Follower	12AX7	12AX7	9A	
V15	Phono Pre-Amp.	6AV6	6AV6	7BT	
V16	Rectifier	5Y3GT	5Y3GT	5T	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: CRAFTSMEN PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	▲40	300	45S102			FP419.5	TM-T40-300	Q-010	
B	20	300					LTD-20-350	MT-4520	
C	■40	300							
D	▲30	300							
C2A	■40	300	45X018			FP230.3	TM-40-300	T-385	
B	▲10	300					TD-12-350		
C3	25	25	45X076			TC26	TD-25-25	FM-0225	
C4	25	25	45X076			TC26	TD-25-25	FM-0225	
C5	1-7		44X005	829-7	532-10				
C6	1-7		44X005	829-7	532-10				
C7	6.8		47CC20CK6R8D	TCZ-6R8	NP0A-6R8	ZT-5568			
C8	2		47CC20CK2R0D	TCZ-2R2	NP0A-2R2				
C9	150		47CC20SL151M	TCZ-150	NP0-334-151	ZT-5315		KR-1315	
C10	150		47CC20SL151M	TCZ-150	NP0-334-151	ZT-5315		KR-1315	
C11	10000		45X068	DD-103	811-01	DC511			
C12	150		47CC20SL151M	TCZ-150	NP0-334-151	ZT-5315		KR-1315	
C13	1000		47CC20SL102M	D6-102	GP2L-102	UC-521		KR-1210	
C14	1-7		44X005	829-7	532-10				
C15	3-12		44X004						
C16	22		47CC20CK220M	TCZ-22	NP0K-220			KR-1422	Note 1
C17	22		47CC20CK220M	TCZ-22	NP0K-220			KR-1422	
C18	1000		47CC20SL102M	D6-102	GP2L-102	UC-521		KR-1210	
C19	1-7		44X005	829-7	532-10				
C20	47			TCN-47	N750K-470	NT-5447			
C21	3-12		44X004						
C22	6.8		47CC20CK6R8D	TCZ-6R8	NP0A-6R8	ZT-5568			
C23	1000		47CC20SL102M	D6-102	GP2L-102	UC-521		KR-1210	
C24	10000		45X068	DD-103	811-01	DC-511			
C25	.047	400	46X473K4						
C26	.1	200	46X104K4						
C27	150		47CC20SL151M	D6-151	GP2K-151	UC-5315		KR-1315	
C28	6.8		47CC20CK6R8D	TCZ-6R8	NP0A-6R8	ZT-5568			
C29	2		47CC20CK2R0D	TCZ-2R2	NP0A-2R2				
C30	150		47CC20SL102M	D6-151	GP2K-151	UC-5315		KR-1315	
C31	1000		47CC20SL102M	D6-102	GP2L-102	UC-521		KR-1210	
C32	100		47CC20SL101M	D6-101	GP1K-101	UC-531		K-1310	
C33	1000		47CC20SL102M	D6-102	GP2L-102	UC-521		KR-1210	
C34	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C35	150		47CC20SL151M	D6-151	GP2K-151	UC-5315		KR-1315	
C36	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1220	
C37	150		47CC20SL151M	D6-151	GP2K-151	UC-531		KR-1315	
C38	150		47CC20SL151M	D6-151	GP2K-151	UC-531		KR-1315	
C39	150		47CC20SL151M	D6-151	GP2K-151	UC-531		KR-1315	
C40	.01	400	46X103K4						
C41	.047	400	46X473K4						
C42	10000		45X068	DD-103	811-01	DC-511			
C43	.047	400	46X473K4						
C44	10000		45X068	DD-103	811-01	DC-511			

PARTS LIST AND DESCRIPTIONS (Continued)
CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: CRAFTSMEN PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C45	.047	400	46X473K4						
C46	.01	400	46X103K4						
C47	.047	400	46X473K4						
C48	47		47CC20UK470M	D6-470	GP1K-470	UC-5447		KR-1447	
C49	10		47CC20SL100M	D6-100	GP1K-100	UC-541		KR-1510	
C50	10000		47X068	DD-103	811-01	DC-511			
C51	10000		45X068	DD-103	811-01	DC-511			
C52	10000		45X068	DD-103	811-01	DC-511			
C53	250	500	47X20D251J			MCE240		KR-1325	
C54	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C55	.047	400	46X473K4						
C56	5000		45X066	DD-502	811-005	DC-525		CR-1250	
C57	5000		45X066	DD-502	811-005	DC-525		CR-1250	
C58	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C59	250	500	47X20D251J			MCE240		KR-1325	
C60	510	500	47X20A511J					KR-1351	
C61	10000		45X068	DD-103	811-01	DC-511			
C62	10000		45X068	DD-103	811-01	DC-511			
C63	150		47CC20SL151M	D6-151	GP2K-151	UC-531		KR-1315	
C64	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C65	.047	400	46X473K4						
C66	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C67	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C68	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C69	10000		47X068	DD-103	811-01	DC-511			
C70	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C71	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C72	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C73	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C74	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C75	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C76	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C77	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C78	100		47CC20SL101M	D6-101	GP1K-101	UC-531		KR-1310	
C79	22		47CC20CK220M	TCZ-22	NP0K-220			KR-1422	
C80	22		47CC20CK220M	TCZ-22	NP0K-220			KR-1422	
C81	430		47X20D431J					KR-1343	
C82	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C83	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	
C84	150		47CC20SL151M	D6-151	GP2K-151	UC-5315		KR-1315	
C85	10000		45X068	DD-103	811-01	DC-511			
C86	10000		45X068	DD-103	811-01	DC-511			
C87	.1	400	46X104K4						
C88	10000		45X068	DD-103	811-01	DC-511			
C89	.047	400	46X473K4						
C90	47		47CC20UK470M	D6-470	GP1K-470	UC-5447		KR-1447	
C91	47		47CC20UK470M	D6-470	GP1K-470	UC-5447		KR-1447	
C92	110	500		TCZ-110	NP0-333-111			KR-1311	Note 2
C93	25	500		TCZ-25	NP0L-250	MCE220		KR-1425	Note 1
C94	.022	400	46X223K4						
C95	.22	200	46X224K4						
C96	.022	400	46X223K4						
C97	.1	400	46X104K4						
C98	.0056	400	46X562K4					CR-1256	
C99	.056	400	46X563K4						
C100	330	500	47X15A331J					KR-1333	Note 1
C101	15			D6-150	GP1K-150	UC-5415		KR-1415	
C102	.0033	400	46X332K4					CR-1233	
C103	.0022	400	46X222K4					CR-1222	
C104	.1	400	46X104K4						
C105	.1	400	46X104K4						
C106	.022	400	46X223K4						
C107	.22	400	46X224K4						
C108	.0033	400	46X332K4					CR-1233	
C109	.047	400	46X473K4						
C110	2400	500	47X35A242J					CR-1224	
C111	100	500	47X15D101J	TCZ-100	NP0-337-101	MCE-235		KR-1310	
C112	.022	400	46X223K4						
C113	1500	500	47X35A152J						
C114	10000		45X068	DD-103	811-01	DC-511			
C115	10000		45X068	DD-103	811-01	DC-511			
C116	.01	600	46X103K6						
C117	10000		45X068	DD-103	811-01	DC-511			
C118	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	Note 1
C119	2200		47CD10X222Y	D6-222	811-0022	UC-5222		CR-1222	Note 1

Note 1. Not used in some versions.
Note 2. Some versions use a 180MMF capacitor in this application.

PROPERTY OF
L. F. BLAIR TV SHOP
3924 MAIN ST.
DENVER, COLO. 80

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESIST-ANCE	WATTS	CRAFTSMEN PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	
R1A	500KΩ	½	23S7M1	Q13-133			UF55A	Volume - Note 1
B	500KΩ			M11-133			UR55L	
C	Shaft						DS-36	Attach to R1A
R2A	500KΩ	½	23S7M3	Q13-133	A47-500K-Z	B-60	U48	Bass - Note 2
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	500KΩ	½	23S7M2	Q13-133	A47-500K-Z	B-60-S	U48	Treble-Note 3
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R3A
C	Switch		Not Req.	76-1	SWE-12	Not Req.	US-26	Attach to R3A
R4A	2500Ω	½	23S747	Q11-112	A47-2500-S	AB-7	U8	Hum Adj. - Note 4
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Not Req.	Attach to R4A

Note 1. Some versions use an alternate control part #26S049.
Note 2. Some versions use an alternate control part #26S051.
Note 3. Some versions use an alternate control part #26S050.
Note 4. Some versions use an alternate control part #26S045.

RESISTORS

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CRAFTSMEN PART No.	IRC PART No.	
R5	100KΩ	½	23B104K	BTS-100K	
R6	27Ω	½	23B270K	BTS-27	
R7	1Meg	½	23B105K	BTS-1Meg	
R8	1000Ω	½	23B102K	BTS-1000	
R9	6.8Ω	½	23B6R8K		
R10	100KΩ	½	23B104K	BTS-100K	
R11	1000Ω	½	23B102K	BTS-1000	
R12	15KΩ	1	23C153K	BTA-15K	
R13	10KΩ	1	23C103K	BTA-10K	
R14	120KΩ	½	23B124K	BTS-120K	
R15	10KΩ	½	23B103K	BTS-10K	Note 1
R16	22KΩ	½	23B223K	BTS-22K	
R17	6.8Ω	½	23B6R8K		
R18	220Ω	½	23B221K	BTS -220	
R19	220Ω	½	23B221K	BTS-220	
R20	100KΩ	½	23B104K	BTS-100K	
R21	120KΩ	½	23B124K	BTS-120K	
R22	330Ω	½	23B331K	BTS-330	
R23	100Ω	½	23B101K	BTS-100	
R24	100KΩ	½	23B104K	BTS-100K	
R25	220KΩ	½	23B224K	BTS-220K	
R26	220KΩ	½	23B224K	BTS-220K	
R27	39Ω	½	23B390K	BTS-39	
R28	68Ω	½	23B680K	BTS-68	
R29	100KΩ	½	23B104K	BTS-100K	
R30	2200Ω	½	23B222K	BTS-2200	
R31	220KΩ	½	23B224K	BTS-220K	
R32	39Ω	½	23B390K	BTS-39	
R33	22KΩ	½	23B223K	BTS-22K	
R34	100Ω	½	23B101K	BTS-100	
R35	22KΩ	2	23D223K	BTB-22K	
R36	2200Ω	½	23B222K	BTS-2200	
R37	68Ω	½	23B680K	BTS-68	
R38	15KΩ	1	23C153K	BTA-15K	
R39	6800Ω	1	23C682K	BTA-6800	
R40	120KΩ	½	23B124K	BTS-120K	
R41	2200Ω	½	23B222K	BTS-2200	Note 2
R42	470KΩ	½	23B474K	BTS-470K	
R43	180Ω	½	23B181K	BTS-180	
R44	150Ω	½	23B151K	BTS-150	
R45	56KΩ 5%	½	23B563J	BTS-56K 5%	
R46	1000Ω	½	23B102K	BTS-1000	
R47	3300Ω	1	23C332K	BTA-3300	
R48	110KΩ 5%	½	23B114J	BTS-110K 5%	
R49	270Ω	½	23B271K	BTS-270	
R50	18KΩ	1	23C183K	BTA-18K	
R51	30KΩ 5%	½	23B303J	BTS-30K 5%	
R52	10KΩ	½		BTS-10K	
R53	47KΩ	½	23B473K	BTS-47K	
R54	150Ω	½	23B151K	BTS-150	
R55	4700Ω	1	23C472K	BTA-4700	
R56	1000Ω	½	23B102K	BTS-1000	
R57	1000Ω	½	23B102K	BTS-1000	
R58	1000Ω	½	23B102K	BTS-1000	
R59	51KΩ 5%	½	23B513J	BTS-51K 5%	
R60	51KΩ 5%	½	23B513J	BTS-51K 5%	
R61	22KΩ	½	23B223K	BTS-22K	
R62	27KΩ	½	23B273K	BTS-27K	
R63	100KΩ 5%	½	23B104J	BTS-100K 5%	
R64	10KΩ	½	25B103F	DCC-10K	
R65	1Meg	½	23B105K	BTS-1Meg	
R66	820KΩ	½	23B824K	BTS-820K	
R67	22KΩ	½	23B223K	BTS-22K	
R68	2.2Meg	½	23B225K	BTS-2.2Meg	
R69	390KΩ	½	23B394K	BTS-390K	
R70	1Meg	½	23B105K	BTS-1Meg	
R71	220KΩ	½	23B224K	BTS-220K	
R72	6.8Meg	½	23B685K	BTS-6.8Meg	
R73	100KΩ	½	23B104K	BTS-100K	
R74	120KΩ	½	23B125K	BTS-120K	
R75	220KΩ	½	23B224K	BTS-220K	
R76	470KΩ	½	23B474K	BTS-470K	
R77	470KΩ	½	23B474K	BTS-470K	
R78	470KΩ	½	23B474K	BTS-470K	
R79	470Ω	½	23B471K	BTS-470	
R80	22KΩ	½	23B223K	BTS-22K	
R81	470KΩ	½	23B474K	BTS-470K	
R82	470Ω	½	23B471K	BTS-470	
R83	22KΩ	½	23B223K	BTS-22K	
R84	47KΩ	½	23B473K	BTS-47K	
R85	47KΩ 5%	½	23B473J	BTS-47K 5%	
R86	4700Ω 5%	½	23B472J	BTS-4700 5%	
R87	1Meg	½	23B105K	BTS-1Meg	
R88	1500Ω	½	23B152K	BTS-1500	
R89	82KΩ	1	23C823K	BTA-82K	
R90	120KΩ 5%	½	23B124J	BTS-120 5%	
R91	1Meg	½	23B105K	BTS-1Meg	
R92	1800Ω	½	23B182K	BTS-1800	
R93	100KΩ 5%	½	23B104J	BTS-100K 5%	
R94	470KΩ	½	23B474K	BTS-470K	
R95	470Ω	½	23B471K	BTS-470	
R96	22KΩ	½	23B223K	BTS-22K	
R97	1Meg	½	23B105K	BTS-1Meg	
R98	1Meg	½	23B105K	BTS-1Meg	
R99	22KΩ	½	23B223K	BTS-22K	
R100	10KΩ	½	23B103K	BTS-10K	Note 3
R101	680Ω 5%	½	25B681J	BTS-680 5%	
R102	82KΩ 5%	1	23C823J	BTA-82K 5%	
R103	150KΩ 5%	½	23B154J	BTS-150K 5%	
R104	150KΩ 5%	½	23B154J	BTS-150K 5%	
R105	1Meg	½	23B105K	BTS-1Meg	
R106	1800Ω	½	23B182K	BTS-1800	
R107	100KΩ 5%	1	23C104J	BTA-100K 5%	
R108	1.5Meg 5%	½	23B155J	BTS-1.5Meg 5%	
R109	36KΩ 5%	½	23B363J	BTS-36K 5%	
R110	68KΩ 5%	½	23B683J	BTS-68K 5%	
R111	180KΩ 5%	½	23B184J	BTS-180K 5%	

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING		REPLACEMENT DATA		NOTES
	OHMS	WATT	CRAFTSMEN PART No.	IRC PART No.	
R112	15KΩ 5%	½	23B153J	BTS-15K 5%	
R113	10KΩ	½	23B103K	BTS-10K	
R114	4700Ω	½	23B472K	BTS-4700	
R115	1500Ω	½	23B152K	BTS-1500	
R116	1000Ω	5	24F102K	1 3/4A-1000	
R117	100KΩ	½	23B104K	BTS-100K	
R118	33KΩ	½	23B333K	BTS-33K	
R119	2.2Ω	½	24B2R2K		
R120	2Meg 5%	½	23B205J	BTS-2Meg 5%	Note 2

Note 1. Some versions use a 2200Ω resistor in this application.
Note 2. Not used in some versions.
Note 3. When G.E. or Pickering pickup is used this resistor is connected from pin 1 of V15 to common.

TRANSFORMER (POWER)

ITEM No.	RATING				REPLACEMENT DATA					
	PRI.	SEC. 1	SEC. 2	SEC. 3	CRAFTSMEN PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ .67A	475VCT .080ADC	5VAC @ 2A	6.3VAC @ 2.2A SEC. 4 6.3VAC @ 2.7A	52S029					

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	CRAFTSMEN PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	FM Ant. Coil	0Ω CT	0Ω	51A008				
L2	Neut. Coil	0Ω		53A019				.2 Microhenry
L3	RF Choke	2.8Ω		53A047	19-1004		4529	4.7 Microhenries, IRC part #CL-1
L4	FM RF Coil	0Ω		51A009				
L5	Trap Coil	1.2Ω		53A044	19-1001		4604	1.5 Microhenries, IRC part #CLA
L6	FM Osc. Coil	0Ω CT		51A010				
L7	AM Ant. Coil	0Ω	5Ω	51A005	14-1410			
L8	AM RF Coil	110Ω	5.5Ω	51A006				
L9	AM Osc. Coil	.9Ω	4.2Ω	51A007	14-1077	BC-387	71-OSC	
L10	Fil. Choke	0Ω		53A051	19-1000	TV-189	4602	.75 Microhenry
L11	1st. FM IF	.4Ω	.4Ω	50X028		FM-251	1451	
L12	Fil. Choke	0Ω		53A051	19-1000	TV-189	4602	.75 Microhenry
L13	1st. AM IF	11Ω	11Ω	50X027				Tertiary winding-.4Ω
L14	2nd. FM IF	.4Ω	.4Ω	50X028		FM-251	1451	
L15	2nd. AM IF	12Ω	12Ω	50X027				Tertiary winding -.4Ω
L16	Fil. Choke	0Ω		53A051	19-1000	TV-189	4602	.75 Microhenry
L17	3rd. FM IF	.4Ω	.4Ω	50X028		FM-251	1451	
L18	3rd. AM IF	7Ω	11Ω *	50X026				* Tapped @ 7.2Ω
L19	Fil. Choke	0Ω		53A051	19-1000	TV-189	4602	.75 Microhenry
L20	FM Limiter	.4Ω	.4Ω	50X029		FM-251	1451	
L21	10KC Filter	400Ω		41B001				1.4 Microhenries
L22	Fil. Choke	0Ω		53A051	19-1000	TV-189	4602	.75 Microhenry
L23	Fil. Choke	0Ω		53A051	19-1000	TV-189	4602	.75 Microhenry
L24	Discriminator	.3Ω	.3Ω CT	50X030		FM-250 ■	1452 ■	

■ Drill new mounting holes.

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∿)	CRAFTSMEN PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L25	.080A	200Ω	4.4 HY	52S016	C5040		C-1709 ①	20C59	C-8X ①

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			CRAFTSMEN PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG S/B	1A 125V	39X019	39X004	313001 (3AG S/B-1A)	342003	MDL 1	HKP

MISCELLANEOUS

ITEM No.	PART NAME	CRAFTSMEN PART No.	NOTES
M2	Dial Light	39X006	#44
M3	Dial Light	39X006	#44
M4	Tuning Cap.	17B008	6 Gang - AM Sections (13-320MMF, 13-320MMF, 20-195MMF)
M5	Switch	62S015	Selector & Phono Compensation (Rotary - wafer type)
	Knob	15B001	Selector & Phono Compensation
	Knob	15A024	Tuning
	Knob	15A025	Volume, Bass, on-off-treble
	Dial Glass Assy.	41B003	

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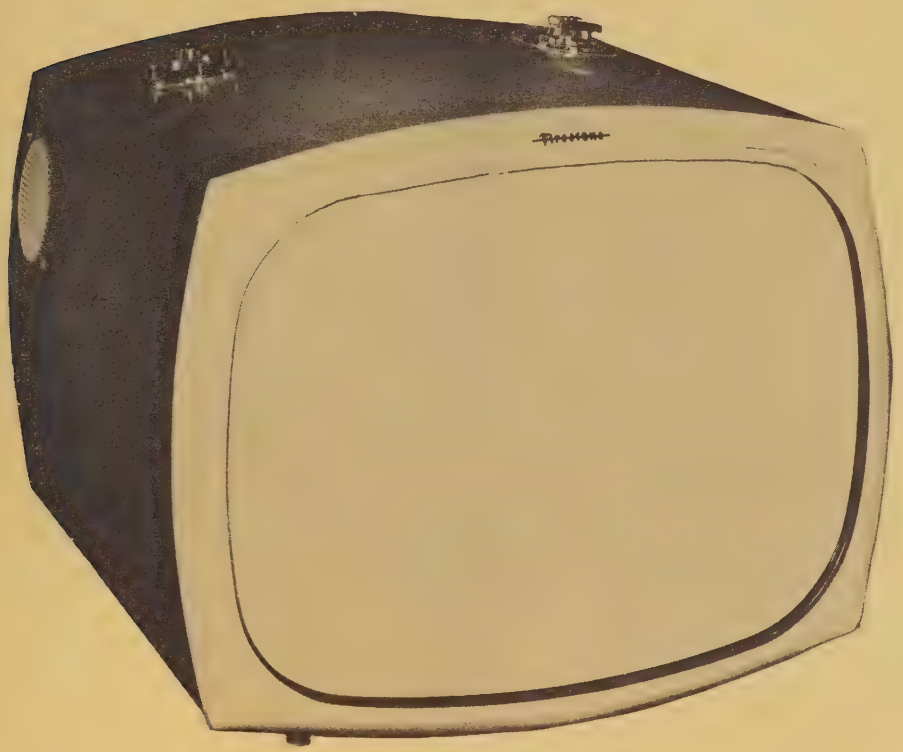

MODEL 13-G-167

FIRESTONE
MODEL 13-G-167

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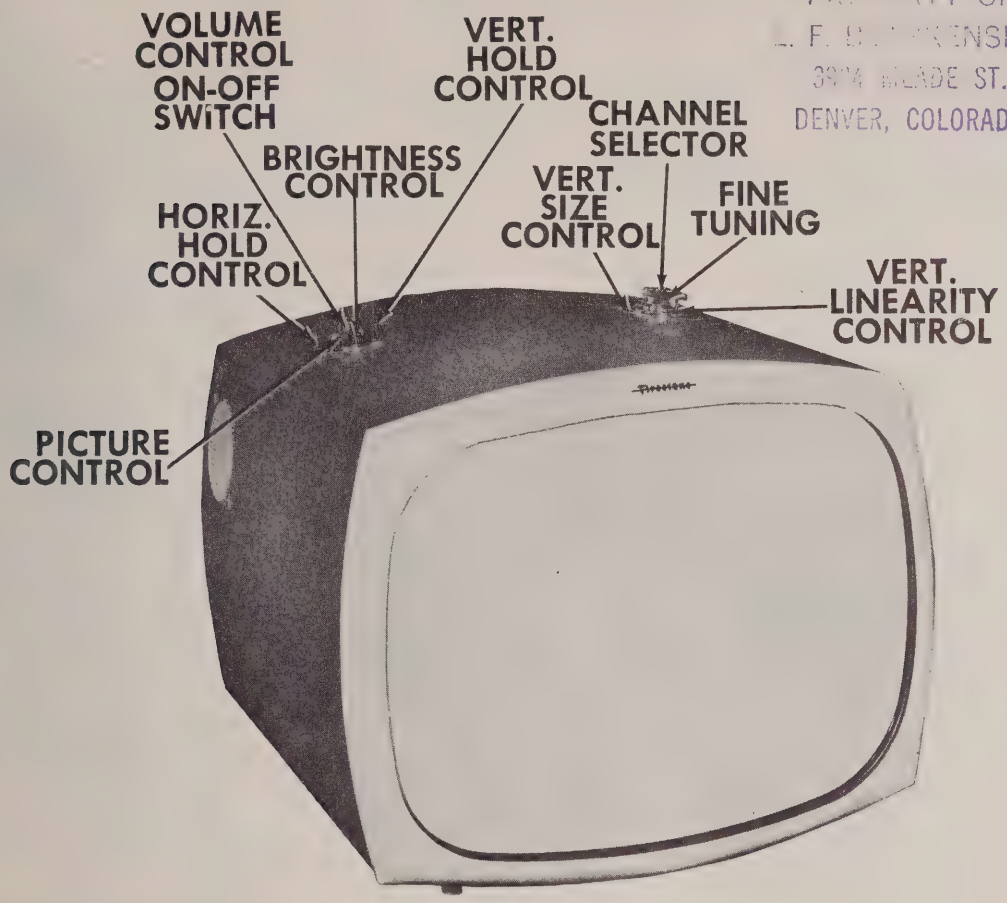

TRADE NAME	Firestone Model 13-G-167 (Code 280-4-21T19AGH)
SUPPLIER	Firestone Tire & Rubber Co., 1200 Firestone Parkway, Akron, Ohio
TYPE SET	Television Receiver
TUBES	Sixteen
POWER SUPPLY	105-115 Volts AC-60 Cycles RATING 1.35 Amp. @ 115 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 46.75MC, Sound IF 42.25MC (Intercarrier)

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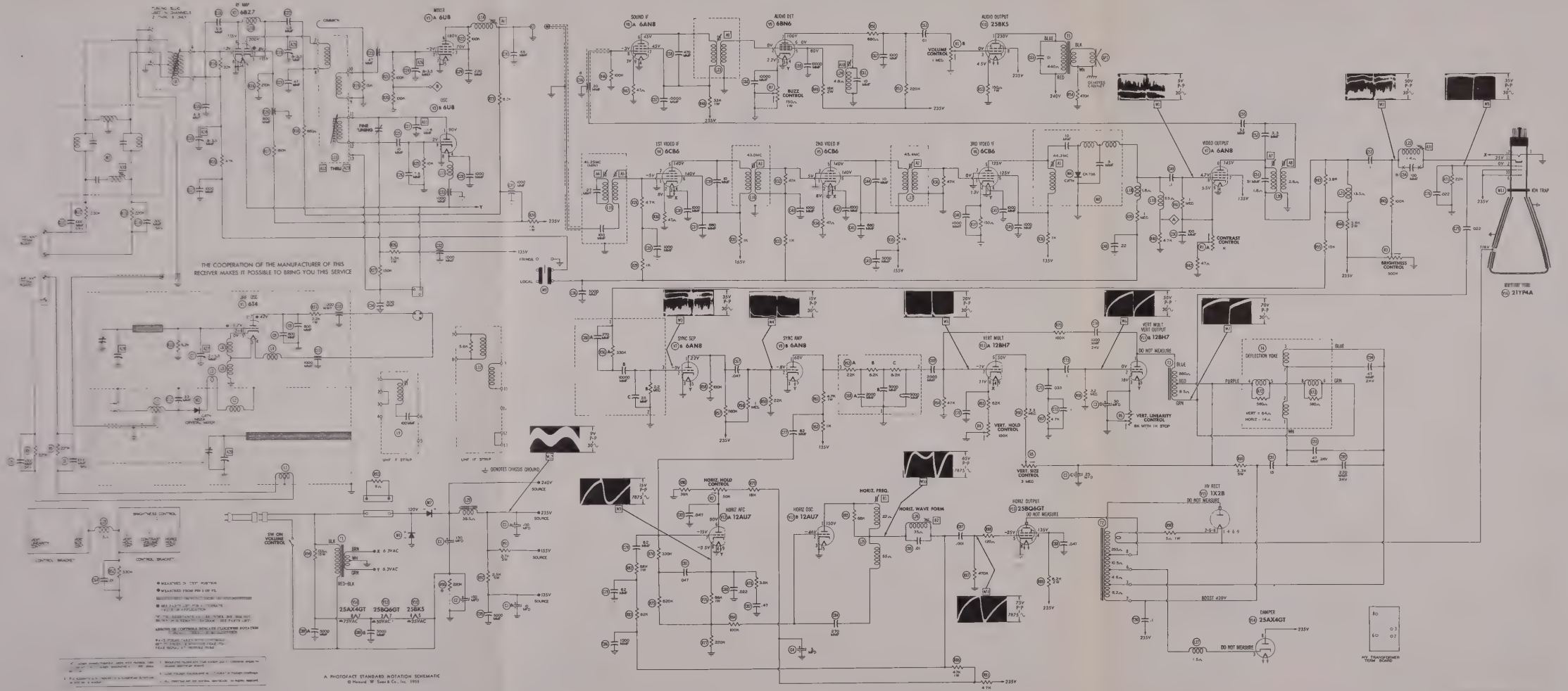
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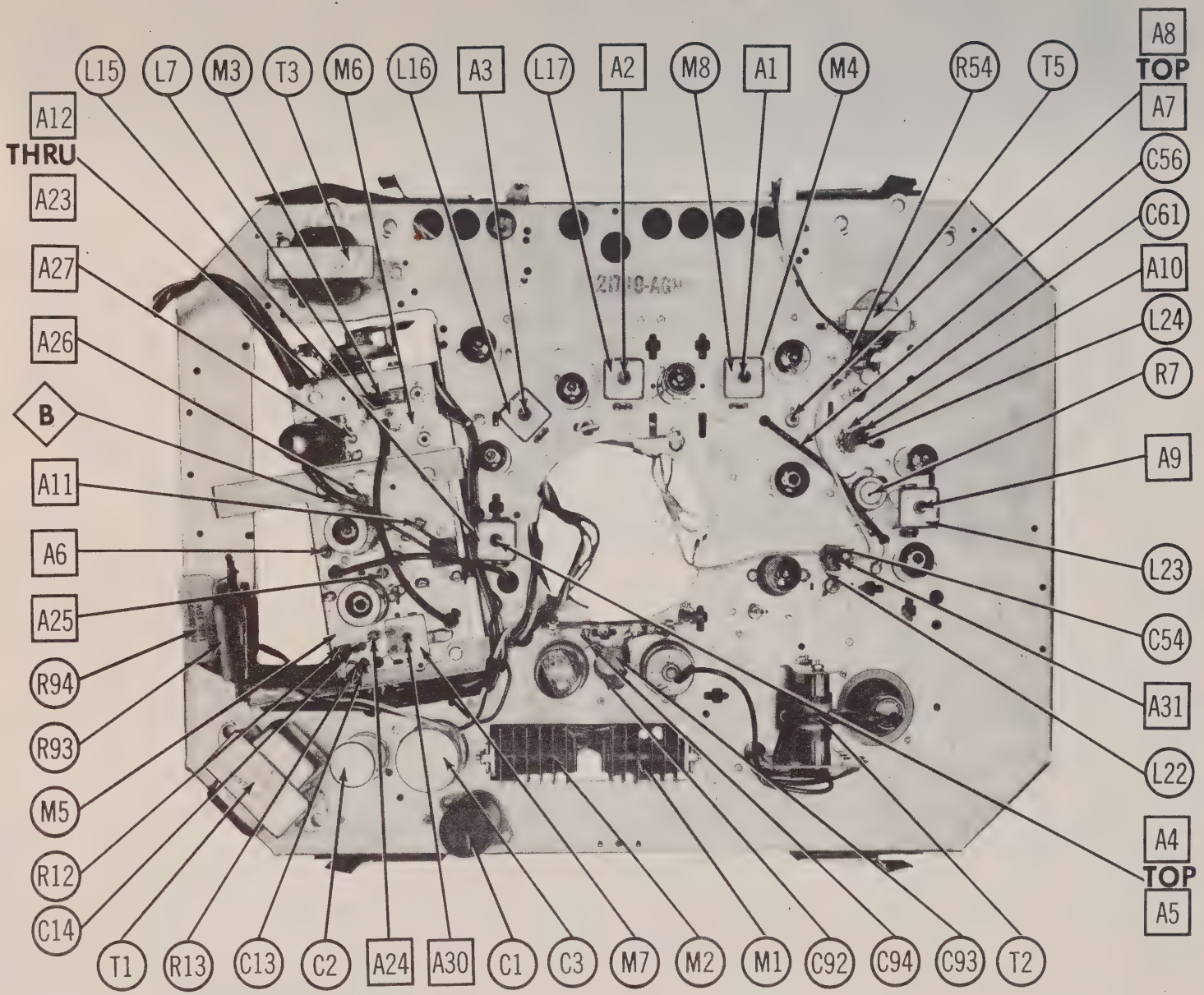

CHASSIS TOP VIEW

MODEL 13-G-167

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SET 286 FOLDER 5

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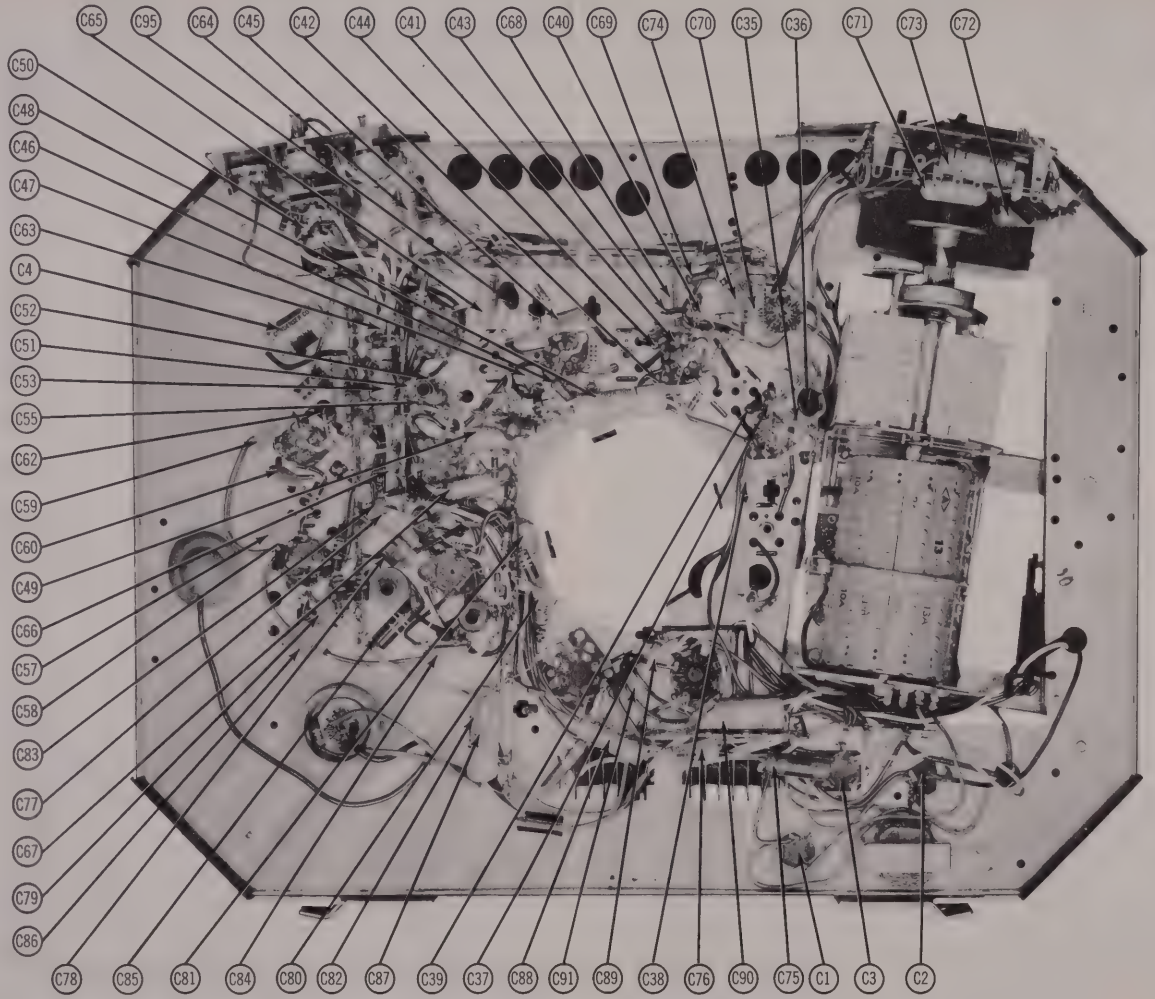

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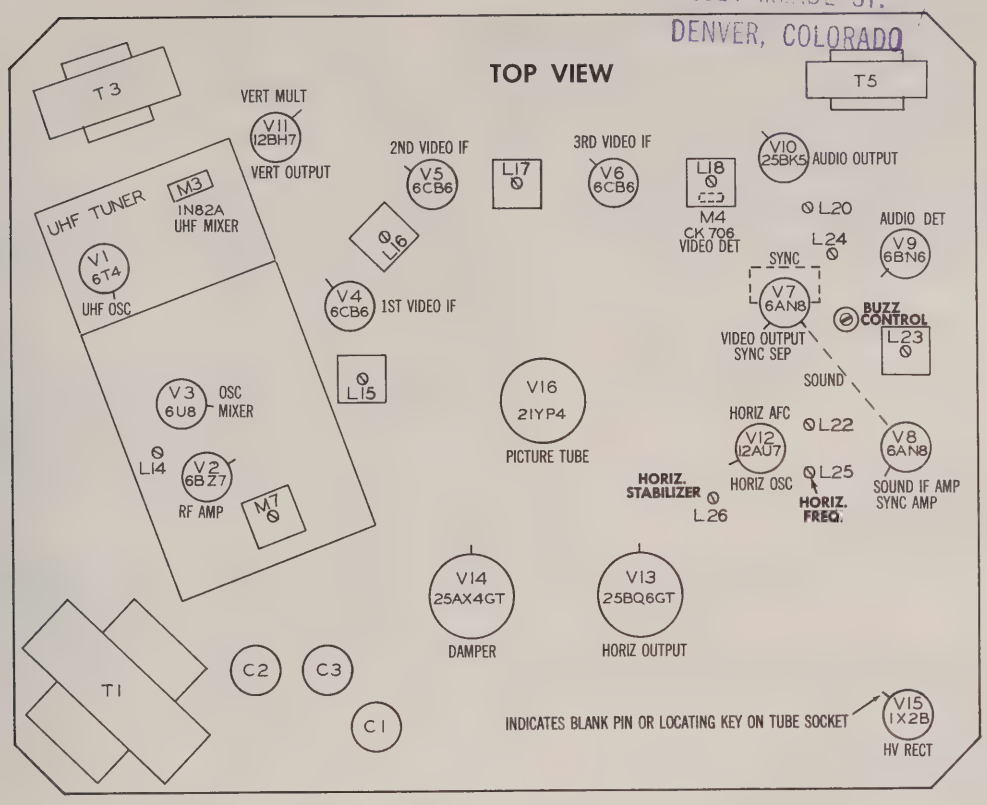
TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

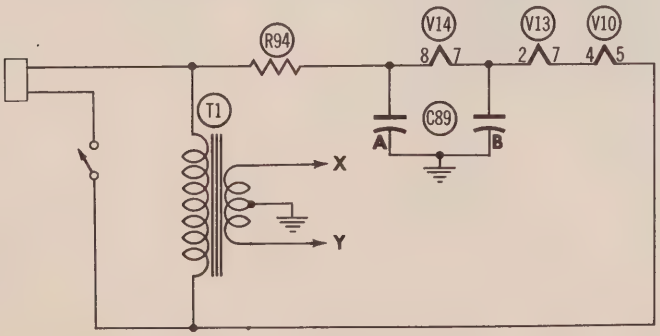
POWER SUPPLY FAILURE
No raster, no sound - **Selenium Rectifiers (M1 & M2)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7 (V1 UHF only)**
No pic, no sound, has snow - **V2, V3, V4**
No pic, has sound, has raster - **V7, V16**
Has pic, no sound - **V8, V9, V10**

SYNC FAILURE
No vert. sync - **V8, V11**
No horiz. sync - **V8, V12**
No vert. or horiz. sync - **V7, V8**

SWEEP FAILURE
No raster, has sound - **V12, V13, V14, V15, V16**
No vertical deflection - **V11**
Poor vert. linearity or foldover - **V11**
Poor horiz. linearity or foldover - **V12, V13, V14**
Narrow picture - **V12, V13, V14, V15, M1, M2**
Vert. off freq. - **V8, V11**
Horiz. off freq. - **V8, V12**

NOTE: Since this receiver employs tubes used in series-parallel filament network, an open filament in any tube in series may cause the set to be inoperative (See circuit below).



ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use an isolation transformer to protect the test equipment.
The high voltage lead should be securely taped and kept away from the chassis.
Do not remove the horizontal oscillator tube (V12) to disable the high voltage.

VIDEO IF ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Remove the converter tube (V3) and replace with a 6U8 which has pin 1 removed. This will disable local oscillator and reduce the possibility of errmneous indications. An alternate method of disabling the local oscillator is to place a piece of transparent cellulose tape on the first two contacts (from front of drum assembly) of any channel and then switching the tuner to the insulated strip.
Connect a .001MFD capacitor across the vertical input of oscilloscope. Use only enough sweep generator output for usable pattern on scope.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.001MFD	High side to pin 1 (grid) of 6CB6 (V4). Low side to chassis.	Not used	44.3MC (Unmod)	10	Use VTVM. DC probe to point Ⓐ. Common to chassis.	A1	Attenuate generator output for approximately 2 volts at VTVM. Adjust for maximum deflection.
2.	"	"	"	45.4MC	"	"	A2	"
3.	"	"	"	43.0MC	"	"	A3	"
4.	"	"	43.0MC (10MC Swp)	42.5MC 45.6MC	"	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.		Use only enough sweep generator output for usable pattern on scope. Check for response curve similar to Fig. 1. Markers should be at 40% on response curve. If necessary, retouch A1 thru A3 until desired response is obtained.
5.	"	High side to ungrounded tube shield floating over dummy converter tube. Low side to chassis.	Not used	41.25MC	"	Use VTVM. DC probe to point Ⓐ. Common to chassis.	A4	Adjust for MINIMUM deflection.
6.	"	"	43.0MC (10MC Swp)	42.5MC 45.6MC 41.25MC	"	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A5, A6	Adjust A5 and A6 for response curve similar to Fig. 2. If necessary, SLIGHTLY retouch A1, A2, A3 and A4 for desired response (Fig. 2).

SOUND IF ALIGNMENT

Tune in a TV station and adjust fine tuning control until sound bars just appear in the picture. Adjust A7 fully counter clockwise, then clockwise until the horizontal scanning lines are smooth and continuous. Readjust the fine tuning control for clearest picture and best sound.
Insert an attenuator in series with the antenna and the receiver antenna terminals so that the signal strength may be varied from weak to strong. If a suitable attenuator is not available stray feed the signal to the receiver by placing the antenna lead-in near the antenna terminals.
Reduce the signal input to the receiver so that the signal falls below the limiting level of the 6BN6 limiter-detector as evidenced by a "hiss" in the sound.
Adjust the secondary of the sound take-off transformer (A8), the sound IF transformer (A9), the quadrature coil (A10 and the buzz control (R7) for maximum sound and minimum buzz. If hiss disappears while adjusting increase attenuation until hiss reappears.

VHF OSCILLATOR ALIGNMENT

Remove dummy converter tube and replace the original 6U8 in its socket or remove the cellulose tape from tuner strip.
Connect the negative lead of a 1.5 volt bias supply to tuner AGC. Connect positive lead to chassis ground.
Complete oscillator alignment may not be necessary. If oscillator seems to be off frequency approximately the same amound for a majority of the channels it may be possible to correct them in one step using A11. It should be noted that this is an all channel oscillator adjustment and should not be used to correct any individual channel. If adjustment of A11 will not bring all channels well within the range of the fine tuning control it will be necessary to adjust the channel strip adjustment screw for each channel that is off frequency. The channel adjustment screws are reached thru a hole just below the channel switch shaft.
The correct adjustment screw is accessible thru the hole as the channel switch is turned to each channel.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A12	Adjust to place sound marker in trap notch as in Fig. 3. Video marker should be at 50%. Use high scope gain and increase sweep generator output to view trap region.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A13	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A23	

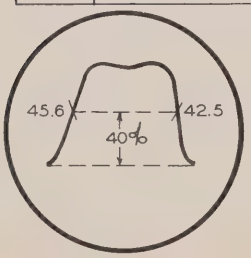


FIG. 1

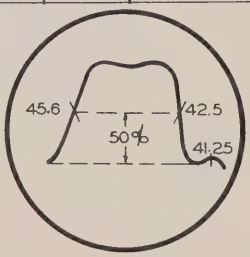


FIG. 2

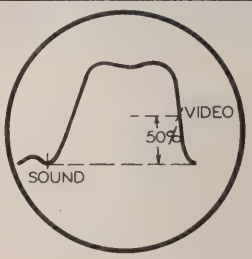


FIG. 3

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DENVER, COLORADO

ALIGNMENT INSTRUCTIONS (cont)

VHF RF AND MIXER ALIGNMENT

Leave bias connected as under "VHF Oscillator Alignment".
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	Two 120Ω Carbon Resistors	Across VHF antenna terminals with 120Ω in each lead.	195MC (10MC Swp)	193.25MC 197.75MC	10	Vert. Amp. thru 10KΩ to point (B). Low side to chassis.	A24, A25, A26	Adjust for response curve similar to Fig. 4 with markers above 90%.
9.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13			If markers fall below 70% on any channel make compromise adjustments of A24, A25 and A26 with channel switch set to that channel. Then check all other channels to see that they have not been seriously affected.
			207MC (10MC Swp)	205.25MC 209.75MC	12			
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
			85MC (10MC Swp)	83.25MC 87.75MC	6			
			79MC (10MC Swp)	77.25MC 81.75MC	5			
			69MC (10MC Swp)	67.25MC 71.75MC	4			
			63MC (10MC Swp)	61.25MC 65.75MC	3			
			57MC (10MC Swp)	55.25MC 59.75MC	2			

UHF TUNER ALIGNMENT

Use only enough sweep generator output to provide usable pattern on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Adjustment of A28 (oscillator) and A29 (RF) is adjusted by bending tab in or out for correct adjustment.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Two 120Ω Carbon Resistors	Across UHF antenna with 120Ω in each lead.	470MC (10MC Swp)	Not used	14	Vert. Amp. thru 10KΩ to point (A). Low side to chassis.	A27	Adjust for curve of maximum amplitude and symmetry similar to Fig. 5.
11.	"	"	870MC (10MC Swp)	45.75MC IF marker	80	"	A28	Loosely couple 45.75MC marker to IF input plug. Adjust A28 (osc. tab) to place 45.75MC marker at 50% on response curve (Fig. 6).
12.	"	"	870MC (10MC Swp)	Not used	"	"	A29	Adjust A29 (RF tab) for maximum amplitude of response curve.

4.5MC TRAP ALIGNMENT

Tune in a local station and set fine tuning control to bring fine herringbone sound beat into the picture. Adjust A31 for minimum sound beat in the picture.

IF WAVE TRAP ADJUSTMENT

The IF wave trap should be tuned to minimize interference caused by signals which fall within the video IF bandpass (40-48MC).
Tune in a station on which the interference is noted and adjust A30 for minimum interference in the picture.

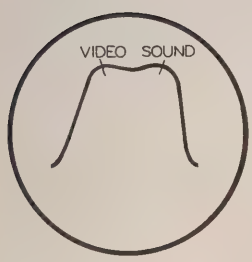


FIG. 4

FIG. 5

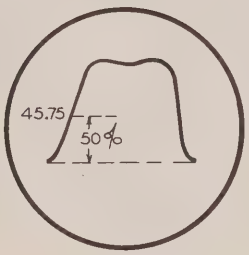
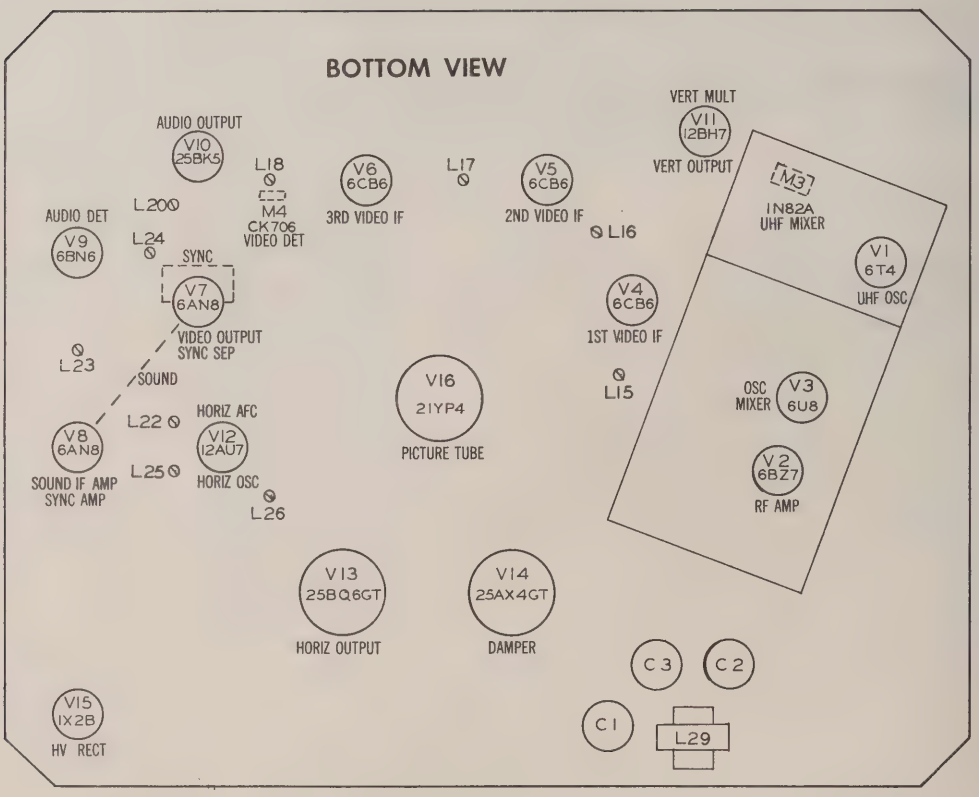


FIG. 6

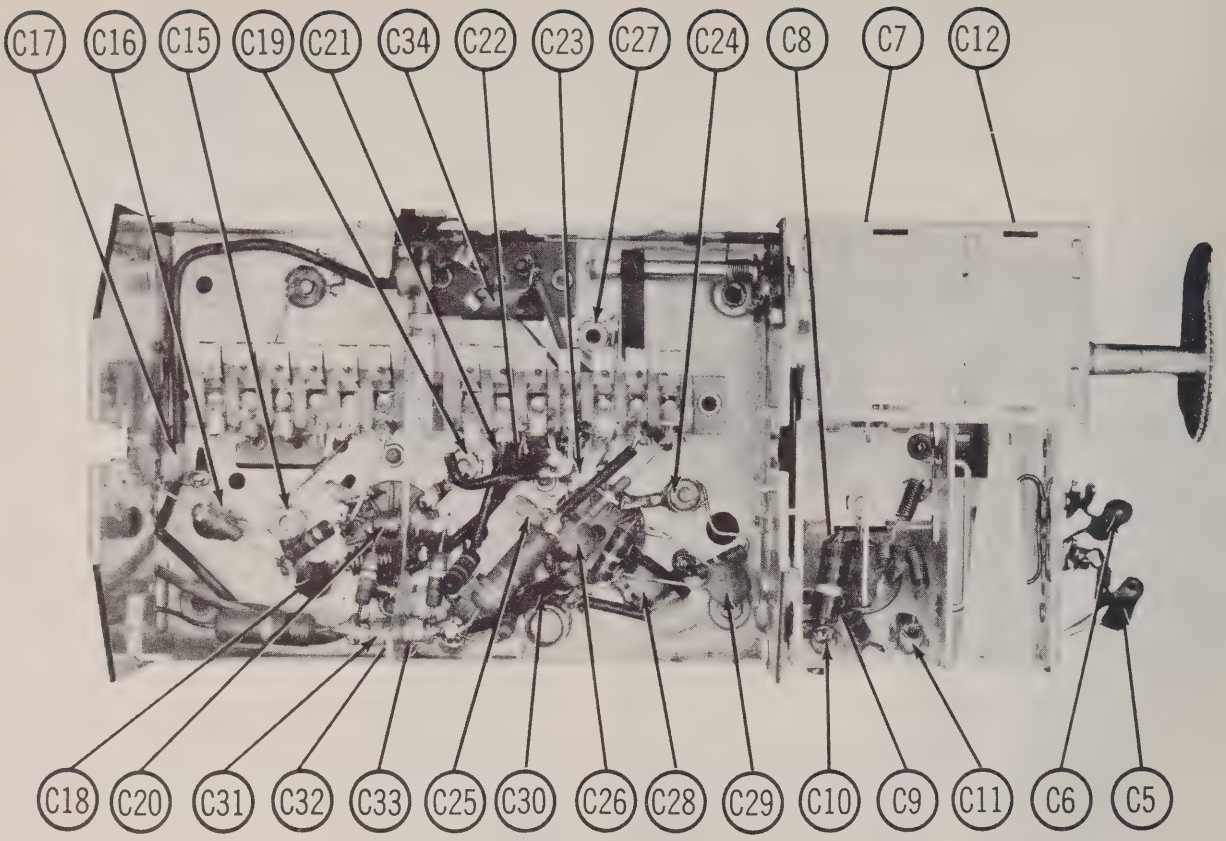
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6T4	*†8KΩ	8. 2KΩ	0Ω	. 1Ω	0Ω	8. 2KΩ	*†8KΩ		
V 2	6BZ7	†1. 7KΩ	130KΩ	INF	0Ω	. 1Ω	INF	1Meg	0Ω	0Ω
V 3	6U8	†5. 8KΩ	200KΩ	†100KΩ	. 1Ω	0Ω	†9. 2KΩ	0Ω	0Ω	10KΩ
V 4	6CB6	1Meg	47Ω	0Ω	. 1Ω	†3. 7KΩ	†3. 7KΩ	0Ω		
V 5	6CB6	1Meg	47Ω	0Ω	. 1Ω	†3. 7KΩ	†3. 7KΩ	0Ω		
V 6	6CB6	0Ω	150Ω	0Ω	. 1Ω	†3. 5KΩ	†3. 5KΩ	0Ω		
V 7	6AN8	†130KΩ	2. 2Meg	0Ω	0Ω	. 1Ω	†5. 6KΩ	†2. 5KΩ	1Meg	250Ω
V 8	6AN8	†8. 2KΩ	22KΩ	0Ω	0Ω	. 1Ω	†33KΩ	†33KΩ	100KΩ	47Ω
V 9	6BN6	250Ω	. 3Ω	0Ω	. 1Ω	†18KΩ	4. 8Ω	†220KΩ		
V 10	25BK5	†440Ω	NC	350KΩ	20KΩ	20KΩ	150Ω	350KΩ	†40Ω	TP
V 11	12BH7	▲4. 2KΩ	2. 2Meg	1. 4KΩ	. 1Ω	. 1Ω	▲4Meg	47KΩ	120KΩ	1. 7Ω
V 12	12AU7	†50KΩ	320KΩ	0Ω	0Ω	0Ω	†50KΩ	1. 4Meg	300KΩ	. 1Ω
V 13	25BQ6GT	NC	20KΩ	TP	†8. 2KΩ	470KΩ	NC	20KΩ	0Ω	Top Cap ▲12Ω
V 14	25AX4GT	TP	NC	600KΩ	NC	†40Ω	NC	20KΩ	20KΩ	
V 15	1X2B		PINS	1 - 8	HAVE	INFINITE	RESISTANCE			Top Cap ▲267Ω
V 16	21YP4	0Ω	22KΩ	Pin 6 †40Ω	Pin 10 †40Ω	Pin 11 †180KΩ	Pin 12 . 1Ω			

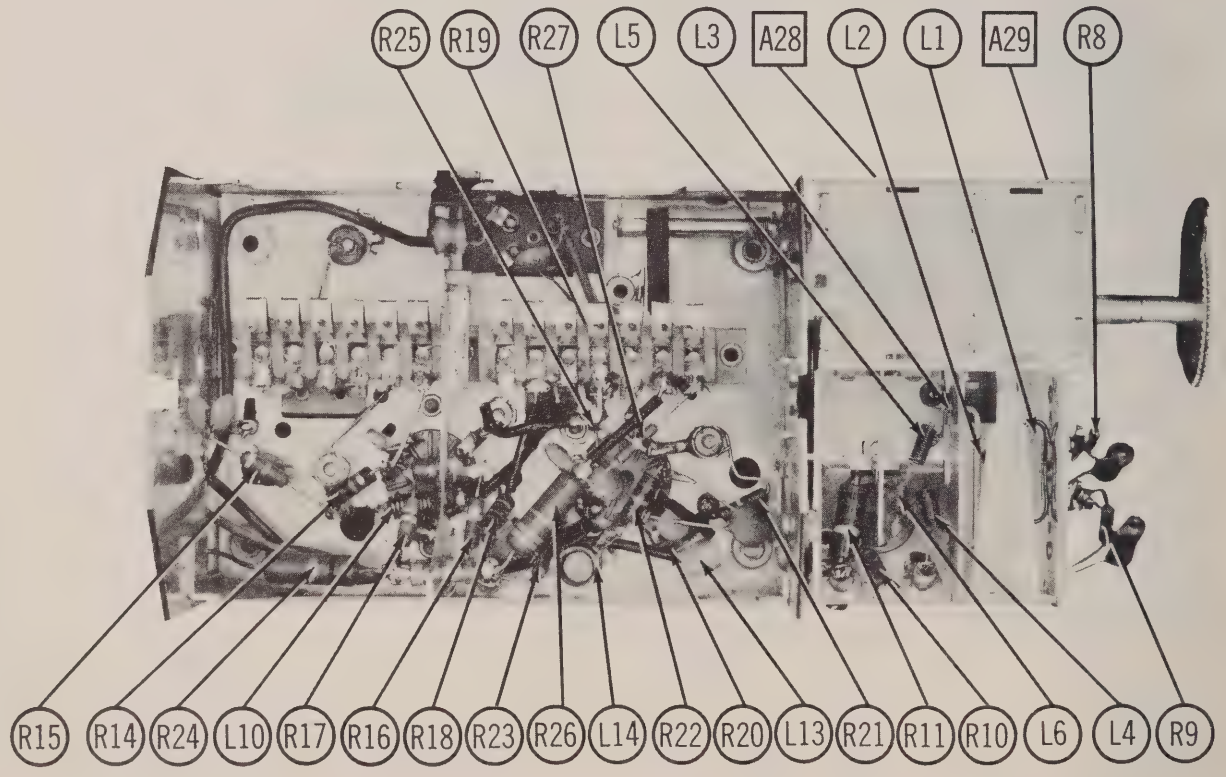
* MEASURED IN "UHF" POSITION.
† MEASURED FROM OUTPUT OF M2.
▲ MEASURED FROM PIN 3 OF V14.
NC - NO CONNECTION
TP - TIE POINT



TUBE PLACEMENT CHART



UHF-VHF TUNER BOTTOM VIEW CAPACITOR IDENTIFICATION



UHF-VHF TUNER BOTTOM VIEW RESISTOR, INDUCTOR & ALIGN. IDENT.

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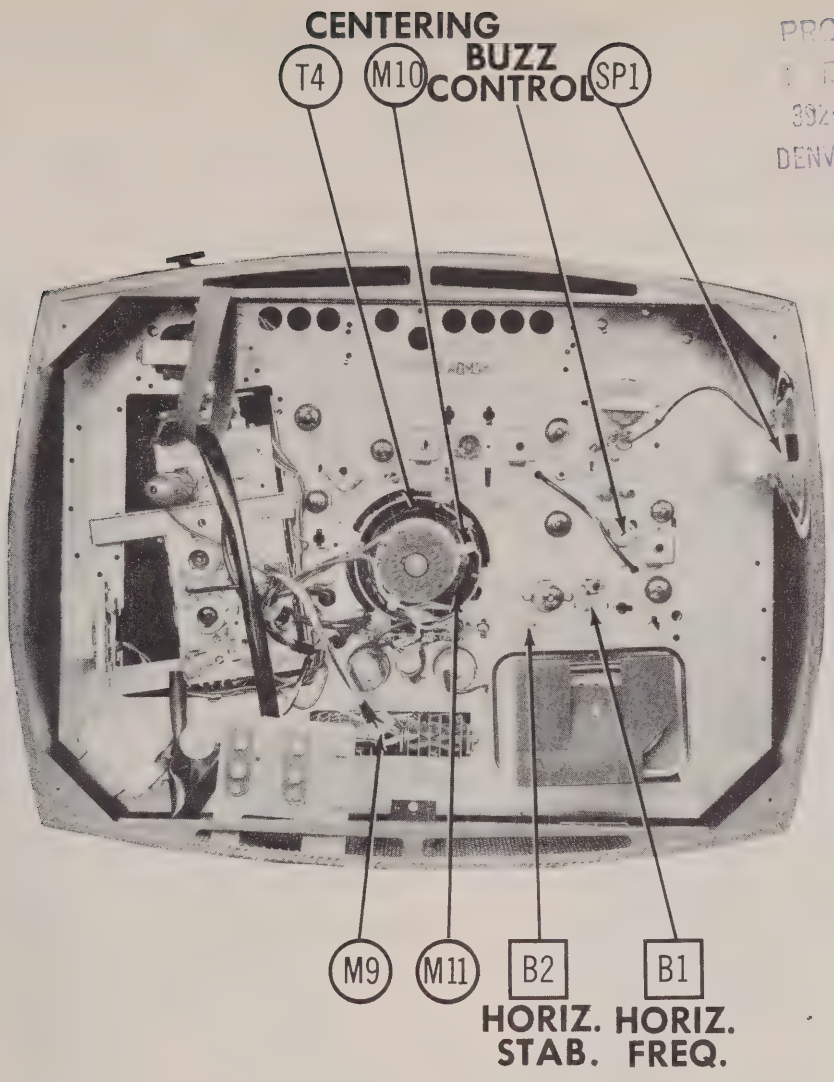
3924 MEADE ST.
DENVER, COLORADO



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a station, preferably a test pattern.

Set the horizontal hold control to its mid-range position.

Connect a short jumper across the horizontal waveform slug (B2).

Starting with the horizontal frequency slug (B1) all the away out (counter clockwise), adjust B1 in a clockwise direction until the picture synchronizes.

Remove short from B2, connect the vertical input of an oscilloscope thru a 10KΩ resistor to the junction of L26, L27, R85 and C85. Connect low side to chassis ground.

Adjust the horizontal waveform slug (B2), until the broad and narrow peaks of the waveform on the scope are of equal height as shown in Fig. 7.

If necessary during alignment of B2 adjust B1 to keep the picture synchronized.

Remove scope from set. Picture should now remain in sync while switching off channel and back again.

If not, rotate the horizontal hold a few degrees.

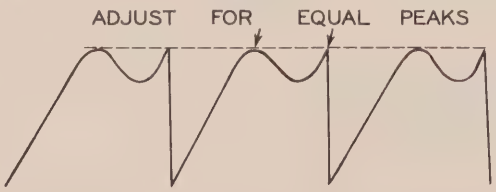


FIG. 7

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V13 and V14. Check M1 and M2. Check R94, R89, C87 and other associated components.

DRIVE LINES

Check by substitution V13 and V14. Check C86, C87, R89 and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V13 and V14. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V12, V13 and V14. Check C81, C80, R76 for open. Check L25, L26, R80, R79, R2, C85, C77 and other associated components.

XMAS TREE EFFECT

Check by substitution V12, V13 and V14. Check T2 and T4 for internal arcing. Check C78, C79, R83, R82 and other associated components.

VERTICAL

LOSS OF SWEEP

Substitute V11. Check waveform W6.

If Satisfactory	If Unsatisfactory
Check T3, T4B, R69, C3C and other associated components.	Check R66, R5, R65, C73, C69, C70 and other associated components.

INSUFFICIENT SWEEP

Substitute V11. Check vertical size and vertical linearity controls for proper operation. Check R66, T3 and other associated components.

COMPRESSED AT BOTTOM

Substitute V11. Check C73, R66, R5, R65 and other associated components.

COMPRESSED AT TOP

Substitute V11. Check C3D, T6, T3, T4B and other associated components.

FOLDS

Substitute V11. Check C71, C72, C73, R67, T3 and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Check by substitution V7 and V8. Check C66, C67, R57, R60, R62, R61 and other associated components.

LOSS OF VERTICAL SYNC - HORIZONTAL SYNC SATISFACTORY

Substitute V11. Check vertical integrator network. Check C69, R65, R4 and other associated components.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Substitute V12. Check C77, C85, C81, C80, R2, R80, R85, R79 and other associated components.

HORIZONTAL BENDING

Check by substitution V7, V8 and V12. Check components associated with V12.

VIDEO

LOSS OF VIDEO

Substitute V7. Check C49, C53, C54, R44 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A31. Check video IF alignment.

POOR CONTRAST

Substitute V7. Check R42, R43, L21, L18, C49, C53 and other associated components.

NEGATIVE PICTURE

Substitute V7. Check picture tube. Check C49, C53, L21 and other associated components.

SMEAR

Substitute V7. Check video crystal detector network. Check L18, L19, L21, C49, C53, C54 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V2, V4, V5, V6 and V7 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V8, V9 and V10. Check stage V10 using audio signal generator. Apply audio signal across R1B.

If Satisfactory	If Unsatisfactory
Check audio detector and audio IF stages for component failure or change of value.	Check C63, C65, R53, R49, R50, R51, T5, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A10 and R7 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or No Sound".

POWER

DEAD SET

If filaments fail to light, except V10, V13 and V14, check T1. If V10, V13 and V14 fail to light, check filament continuity and R94, since these tubes are connected in series. Check AC interlock assembly and switch on volume control. If filaments light, check M1 and M2. Check R93. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Check M1, M2 and R93. Check B+ filter and decoupling network.

PROPERTY OF
L. F. BLANKENSHIP
[illegible] MEADE ST.
DE[illegible]. COLORADO

CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

MODEL 13-G-167

FIRESTONE

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLO.

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: FIRESTONE PART No.	STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	UHF Osc.	6T4	6T4	7DK	
V2	R-F Amp.	6BZ7	6BZ7	9AJ	
V3	Mixer-Osc.	6U8	6U8	9AE	
V4	1st Video IF Amp.	6CB6	6CB6	7CM	
V5	2nd Video IF Amp.	6CB6	6CB6	7CM	
V6	3rd Video IF Amp.	6CB6	6CB6	7CM	
V7	Video Output-Sync Sep.	6AN8	6AN8	9DA	
V8	Sound IF Amp. - Sync Amp.	6AN8	6AN8	9DA	
V9	Audio Det.	6BN6	6BN6	7DF	
V10	Audio Output	25B8S	25B8S	9BQ	
V11	Vert. Mult. - Vert. Output	12BH7	12BH7	8A	
V12	Horiz. AFC - Horiz. Osc.	12AU7	12AU7	9A	
V13	Horiz. Output	25B8GGT	25B8GT	9AM	
V14	Damper	25A3GT	25A3GT	6CG	
V15	HV Rectifier	1X2B	1X2B	9Y	

CATHODE-RAY TUBE

ITEM No	REPLACEMENT DATA: FIRESTONE PART No.	CBS-HYTRON PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V16	21YP4A 1 21YP4	21YP4A 1 21YP4	21YP4A 1 21YP4	21YP4A 2 21YP4	21YP4A ① 21YP4	13L 13L	① Aluminized ② Silver Screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: FIRESTONE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C1	150	150	SC-23464			FP117	TM-150-150	T-050	
C2	150	150	SC-23463			FP117	TM-150-150	T-050	
C3A	±100	300	SC-23689				TM-4128	K-820 MT-0550	
B	±10	300							
C	±35	450							
D	50	30							
C4	5	300	SC-24274			TC50		FM-4504	
C5	1000	1000	SG-23656	DD30-102	1RSKV-103	DC-3021		C-3210	
C6	1000	1500	SG-23656	DD30-102	1RSKV-103	DC-3021		C-3210	
C7	2-5.5			829-6					
C8	800								
C9	900								
C10	1000		32-13277-1						
C11	1000		32-13277-1						
C12	33			TCN-33	M750K-330				
C13	1000	1500	SG-23656	DD30-102	1RSKV-103	DC-3021		C-13210	
C14	1000	1500	SG-23656	DD30-102	1RSKV-103	DC-3021		C-13210	
C15	5.8-8		32-200010-8						
C16	6.8		32-200044-4	TCZ-6R8	NPOA-6R8	ET-5568			
C17	1000		32-200044-3	DD-102	801-001	DC-521			
C18	3.8		32-200044-5						
C19	8-3.5		32-200010-14						
C20	600		32-200020-1						
C21	47		32-200044-1	DD-470	831-470	UC-5447			
C22	1.5		32-200044-8	TCZ-1R5	NPOA-1R5	ZT-5515			
C23	47		32-200010-1	M7T-300					
C24	8-3.5		32-200010-7						
C25	15		32-200044-7						
C26	7.5		32-200044-6						
C27	1-4		32-200010-11	829-4	3115-01-10				
C28	1000		32-200044-2	DD-102	801-001	DC-521			
C29	220		32-200044-9	DD-221	811-231	UC-5323			
C30	68		32-200044-11	TCN-68	N750L-680	NT-5468			
C31	1000		32-13277-1						
C32	1000		32-13277-1						
C33	1000		32-13277-1						
C34	600		32-200044-3	DD-801	831-001	DC-521			
C35	1000		SG-13201	DD-102	801-001	DC-521		K-1210	
C36	5000		SG-13202	DD-502	811-005	DC-525		C-1250	
C37	680		SG-21105	D6-681	GP2K-681	UC-5368		K-1268	
C38	1000		SG-13201	DD-102	801-001	DC-521		K-1210	
C39	10		SG-10502	TCP-10	N750K-100	NT-541		K-1410	
C40	1000		SG-13201	DD-102	801-001	DC-521		K-1210	
C41	680		SG-21105	D6-681	GP2K-681	UC-5368		K-1268	
C42	1000		SG-13201	DD-531	801-001	DC-521		K-1210	
C43	5000		SG-13202	DD-502	811-005	DC-525		C-1250	
C44	10		SG-10502	TCP-10	N750K-100	NT-541		K-1410	
C45	1000		SG-20754	D6-102	GP2L-102	UC-521		K-1210	
C46	1000		SG-20754	D6-102	GP2L-102	UC-521		K-1210	
C47	1000		SG-13201	DD-102	801-001	DC-521		K-1210	
C48	.22	200	SG-23084			PT4022	IMP2-P22	3302322	
C49	.1	200	SG-23084	DF-104		PT401	IMP2-P1	330201	
C50	100		SG-11734	D6-101	GP1K-101	UC-521		K-1310	
C51	82		SG-23783						
C52	2.2		SL-23581	TCZ-2R2	NPOA-2R2	ZT-5533			
C53	.1	600	SK-23085	DF-104		PT401	IMP4-P1	330401	
C54	300	500		TCZ-300	NPO-337-301	MC3235		KR-1210	Note 1
C55	33		SG-13903	TCZ-33	NPOK-330	ZT-5433			Note 2
C56	30		MB-23772						
C57	10000		SG-20289	DD-103	811-01	DC-511			
C58	470	500	SF2-121	D6-471	811-471	MC3245		KR-1247	
C59	10000		SG-20289	DD-103	811-01	DC-511			
C60	10000		SG-20289	DD-103	811-01	DC-511			
C61	10		SG-11789	TCZ-10	NPOK-100	ZT-531		KR-1410	
C62	1000		SG-13201	DD-102	801-001	DC-521		K-1210	
C63	.01	400	SK-23091	D6-103	GP2-333-103	PT411	IMP4-S1	330411	
C64	.01	400	SK-23091	D6-103	GP2-333-103	PT411	IMP4-S1	330411	
C65	.01	600	SK-23103	D6-103	GP2-333-103	PT611	IMP6-S1	330611	

CAPACITORS (cont)

ITEM No.	RATING: CAP.	VOLT	REPLACEMENT DATA: FIRESTONE PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No	PYRAMID PART No	SANGAMO PART No	NOTES
C66A	270								
B	10000		717A-24112	DD-103	811-01	DC-511		330611	
C	25			D6-250	GP1K-250	DC-5425		K-1425	
C67	.047	200	SK-23093	DF-503		PT4147	IMP2-S47	3302147	
C68A	1000					PT923	IMP6-D3	C-1220	
B	5000		417A-23376	4PC-100	4406-01	PT925	IMP6-D5	C-1250	
C	5000					PT625	IMP6-D5	C-1250	
C69	3000		SG-10522	D6-302	GP2-333-302	DC-523		C-1220	
C70	.1	300	SK-23084	DF-104		PT401	IMP2-P1	330201	
C71	.033	400	SK-23616	DF-303		PT4133	IMP6-S3	3306133	
C72	.1	300	SK-23084	DF-104		PT401	IMP2-P1	330201	
C73	.1	400	SK-23095	DF-104		PT401	IMP4-P1	330401	
C74	1000	3000	SG-23781	DD30-102	3KV-103	DC-3021		C-3210	
C75	.033	600	SK-23104	DF-303	817-03	PT4133	IMP6-S33	3306133	
C76	.022	400	SK-23082	DF-303	817-03	PT4122	IMP4-S22	3304122	
C77	.82	500	SF3-112	TCZ-82	NPO-337-820			KR-1482	
C78	82	500	SF3-111	TCZ-82	NPO-337-820			KR-1482	
C79	82	500	SF3-111	TCZ-82	NPO-337-820			KR-1482	
C80	.033	300	SK-23083	DF-303	817-03	PT4133	IMP4-S33	3306133	
C81	.047	300	SK-23083	DF-503		PT4147	IMP2-S47	3302147	
C82	.47	300	SK-23087			PT4047	IMP3-P47	3303147	
C83	.047	400	SK-23094	DF-503		PT4147	IMP4-S47	3304147	
C84	270	500	SF5-235	TCZ-270	NPO-335-271			KR-1327	
C85	.01	600	SK-24439						
C86	1000	500	SF8-125			MC3255		KR-1210	
C87	.001	600	SK-23099	D6-103	GP2L-102	PT931	IMP6-D1	330631	
C88	.047	400	SK-23094	DF-503		PT4147	IMP4-S47	3304147	
C89A	5000		SG-23790	DD3-502	811-005	DC-525		C-1250	
B	5000				811-005	DC-525		C-1250	
C90	.1	600	SK-23106	DF-104		PT901	IMP6-P1	330601	
C91	.15	300	SK-23085			PT4015	IMP4-P15	3304015	
C92	220	3000	SG-23853	DD30-221	3KV-221			K-3323	
C93	47	3000	SG-24038	DD30-470	3KV-470			K-4447	
C94	47	2000	SG-23845	DD30-470	3KV-470	MC1447		K-4447	
C95	5000		SG-13962	DD-502	811-005	DC-525		C-1250	

Note 1. Not used in some versions.
Note 2. Sound IF coupling shielded lead.
† Items C58A, C58B, C68C, R58A, R58B are combined in one unit.
• Items C58A, C58B, C68C, R63A, R63B and R63C are combined in one unit.

CONTROLS

ITEM No.	REPLACEMENT DATA: RESISTANCE	WATTS	FIRESTONE PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No	INSTALLATION NOTES
R1A	1000Ω		B10A-23714	*QJ-734	RTV-686	F1-4	UF13L	Contrast - Panel
B	1Meg					R2-53	UR16A	Volume - Rear
C	Switch					R3-1	UR-58	Attach to R1B
R2A	50KΩ		B10B-23694	Q11-133	A47-50K-S	AB-31	U-35	Horiz. Hold
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R2A
R3A	500KΩ		B10B-23695	Q11-133	A47-500K-S	AB-39	U-50	Brightness
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R3A
R4A	100KΩ		B10B-23693	Q11-129	A47-100K-S	AB-40	U-41	Vert. Hold
B	Shaft		Not Req.	Not Req.	KS8-3	AK-4	Not Req.	Attach to R4A
R5A	1Meg		B10B-23696	Q11-140	A47-1Meg-S	AB-34	SU-59	Vert. Size
B	Shaft		Not Req.	RQ	FK8-1/4	AK-1	Not Req.	Attach to R5A
R6A	6000Ω with 1000Ω stop		B10B-23407	Q11-114	A47-6000-S	AB-30	SU-14	Vert. Linearity - Note
B	Shaft		Not Req.	RQ	FK8-1/4	AK-1	Not Req.	Attach to R6A
R7	750Ω	1	A10D-23857		39-750			Buzz (Wire wound)

* CONCENTRIKIT EQUIVALENT: KIT K-8, BASE ELEMENTS & SHAFTS: B1?-108 & P?1-102 (PANEL)
B13-137 & R2-115 (REAR)
76-1 SWITCH

† Universal replacement (Mallory exact duplicate part no. UE652)
Note: Connect a 10000 resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control. (Control viewed from shaft end, terminals down.)

RESISTORS

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: FIRESTONE PART No.	IRC PART No.	NOTES
R8	220KΩ	½	BB1-90	BTS-220K	
R9	220KΩ	½	BB1-90	BTS-220K	
R10	330Ω	½	BB1-73	BTS-330	
R11	220Ω	½	BB2-58	BTA-220Ω	
R12	220KΩ	½	BB1-27	BTS-220K	
R13	220KΩ	½	BB1-27	BTS-220K	
R14	22KΩ	½	BB1-78	BTS-22K	
R15	47KΩ	½	BB1-33	BTS-47K	
R16	270KΩ	½	BB1-91	BTS-270K	
R17	180KΩ	½	BB1-89	BTS-180K	
R18	680Ω	½	BB1-60	BTS-680	
R19	15KΩ	½	BB1-76	BTS-15K	
R20	100KΩ	½	BB1-25	BTS-100K	
R21	100KΩ	½	BB1-25	BTS-100K	
R22	100KΩ	½	BB1-98	BTS-100K	
R23	330Ω	½	BB1-73	BTS-330	
R24	1000Ω	½	BB2-62	BTA-1000	
R25	10KΩ	½	BB1-74	BTS-10K	
R26	3300Ω	1	BB2-66	BTA-3300	
R27	150KΩ	½	BB1-26	BTS-150K	
R28	4700Ω	½	BB1-70	BTS-4700	
R29	100Ω	½	BB1-63	BTS-100	
R30	47Ω	½	BB1-46	BTS-47	
R31	100Ω	½	BB1-52	BTS-100	
R32	47KΩ	½	BB1-82	BTS-47K	
R33	100Ω	½	BB1-52	BTS-100	
R34	47Ω	½	BB1-46	BTS-47	
R35	100Ω	½	BB1-52	BTS-100	
R36	47KΩ	½	BB1-82	BTS-47K	
R37	150Ω	½	BB1-53	BTS-150	

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: FIRESTONE PART No.	IRC PART No.	NOTES
R38	100Ω	½	BB1-52	BTS-100	
R39	1Meg	½	BB1-98	BTS-1Meg	
R40	4700Ω	½	BB1-70	BTS-4700	
R41	1Meg	½	BB1-98	BTS-1Meg	
R42	47Ω	½	BB1-46	BTS-47	
R43	3900Ω	½	BB1-69	BTS-3900	
R44	560Ω	2	BB4-71	BTS-5600	
R45	100KΩ	½	BB1-88	BTS-100K	
R46	100KΩ	½	BB1-98	BTS-100K	
R47	47Ω	½	BB1-46	BTS-47	
R48	33KΩ	1	BB2-80	BTA-33K	
R49	18KΩ	2	BB4-77	BTS-18K	
R50	680Ω	½	BB1-60	BTS-680	
R51	220KΩ	½	BB1-90	BTS-220K	
R52	330KΩ	1	BB1-92	BTS-330K	
R53	150Ω	1	BB2-52	BTA-150	
R54	470KΩ	½	BB1-29	BTS-470K	
R55	10KΩ	½	BB1-74	BTS-10K	
R56A	330KΩ	½		BTS-330K	
B	2.2Meg		†17A-24212	BTS-2.2Meg	
R57	560KΩ	½	BB1-95	BTS-560K	
R58	100KΩ	½	BB1-98	BTS-100K	
R59	22KΩ	½	BB1-78	BTS-22K	
R60	1Meg	½	BB1-98	BTS-1Meg	
R61	4700Ω	1	BB2-70	BTA-4700	
R62	100Ω	½	BB1-62	BTS-100	
R63A	220Ω			BTS-220	
B	8200Ω		†17A-23376	BTS-8200	
C	8200Ω			BTS-8200	
R64	47KΩ	½	BB1-82	BTS-47K	

RESISTORS (cont)

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: FIRESTONE PART No.	IRC PART No.	NOTES
R65	82KΩ	½	BB1-85	BTS-82K	
R66	3.3Meg	½	BB1-104	BTS-3.3Meg	
R67	4700Ω	½	BB1-70	BTS-4700	
R68	3.3Meg	½	BB1-102	BTS-3.3Meg	
R69	3300Ω	5	9C12-1105	PW7-3300	
R70	100KΩ	½	BB1-98	BTS-100K	
R71	22KΩ	½	BB1-78	BTS-22K	
R72	560Ω	½	BB1-59	BTS-560	
R73	560Ω	½	BB1-59	BTS-560	
R74	330KΩ	½	BB1-92	BTS-330K	
R75	820KΩ	½	BB1-97	BTS-820K	
R76	82KΩ	½	BB1-84	BTA-82K	
R77	220KΩ	½	BB1-90	BTS-220K	
R78	3900Ω	½	BB1-69	BTS-3900	
R79	18KΩ	½	BB1-77	BTS-18K	
R80	39KΩ	½	BB1-81	BTS-39K	

ITEM No.	RATING: OHMS	WATT	REPLACEMENT DATA: FIRESTONE PART No.	IRC PART No.	NOTES
R81	470Ω	½	BB1-67	BTS-470	
R82	68KΩ	½	BB3-84	BTA-68K	
R83	82KΩ	½	BB1-85	BTS-82K	
R84	100KΩ	½	BB1-88	BTS-100K	
R85	68KΩ	½	BB1-84	BTS-68K	
R86	47KΩ	1	BB3-83	BTA-47K	
R87	470KΩ	½	BB1-94	BTS-470K	
R88	130Ω	½		BTS-130	
R89	8200Ω	3	BB4-73	BTS-8200	
R90	1.5Ω	1	9C1-1065		
R91	3700Ω	3	9C11-1104		
R92	3500Ω	5	9C-23023	PW7-3500	
R93	9Ω		43M-23018		
R94	133Ω	15	9C-23972		
R95	220KΩ	½	BB1-27		Note

Note: Not used in some versions.
† Items R58A, R58B, C68A, C68B and C68C are combined in one unit.
• Items R63A, R63B, R63C, C68A, C68B and C68C are combined in one unit.

TRANSFORMER (FILAMENT)

ITEM No.	RATING: PRI.	SEC. 1	SEC. 2	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Stancor PART No.	Thordarson PART No.	Triad PART No
T1	117VAC	① 6.3V ② 2.35A		12D-23699		P-2952			21F67	

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No.	Merit PART No	RCA PART No.	Ram PART No.	Stancor TYPE No.	Thordarson PART No.	Triad PART No
T2	Horiz. Output Trans.	13E-23939						FLY-80	
T3	Vert. Output Trans.	13E-23726	Z1804	A-3037	222T1	V31B	A-8123	26B52	A-102X
T4A	Yoke-Horiz. (9MM)	20I-23744 ①	DF804 ②③	MDF-702 ③	205D1 ④	V70FD/45	DY-8A ③	Y-52 ②	Y-13 ② ③
B	Vert. (42MM)			③		④⑤			

① Deflection yoke assembly, includes deflection yoke, Firestone part #13M-23755; yoke positioning screw, Firestone part #32H-13186 and resistors R72 & R73.
② Use original rear cover and centering device.
③ Use original horizontal damping network.
④ Use original yoke damping network.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI	SEC	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T5	7kΩ	3.7Ω	13C-23704	21113	A-3068	A-3678	26S48	S-7X	

SPEAKER

ITEM No.	RATINGS: SIZE	FIELD	V C IMP	REPLACEMENT DATA: FIRESTONE PART No.	QUAM PART No.	NOTES
SP1	5"	PM	3.7Ω	18A-21216	5A07	

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	SEC.	REPLACEMENT DATA: FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	UHF Ant. Coil	0Ω						Tapped
L2	UHF R.F Choke	0Ω						
L3	UHF Osc. Coupling Coil	0Ω						
L4	Fil. Choke	0Ω		83-64245				
L5	Fil. Choke	0Ω		83-64245				
L6	Cathode Choke	0Ω		83-64246				
L7	UHF IF Output	00CT		83-64681				
L8A	VHF Ant.-"1"	0Ω CT	0Ω	83-64152				Channel 2
B	VHF Ant. Coil	0Ω CT	0Ω	83-64153				Channel 3
C	VHF Ant. Coil	0Ω CT	0Ω	83-64154				Channel 4
D	VHF Ant. Coil	0Ω CT	0Ω	83-64155				Channel 5
E	VHF Ant. Coil	0Ω CT	0Ω	83-64156				Channel 6
F	VHF Ant. Coil	0Ω CT	0Ω	83-64157				Channel 7
G	VHF Ant. Coil	0Ω CT	0Ω	83-64158				Channel 8
H	VHF Ant. Coil	0Ω CT	0Ω	83-64159				Channel 9
I	VHF Ant. Coil	0Ω CT	0Ω	83-64160				Channel 10
J	VHF Ant. Coil	0Ω CT	0Ω	83-64161				Channel 11
K	VHF Ant. Coil	0Ω CT	0Ω	83-64162				Channel 12
L	VHF Ant. Coil	0Ω CT	0Ω	83-64163				Channel 13
L9	UHF LF Coil			83A-64663				
L10	Neut. Coil	0Ω		39-12676-2				
L11A	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64172				Channel 2
B	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64173				Channel 3
C	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64174				Channel 4
D	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64175				Channel 5
E	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64176				Channel 6

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA: FIRESTONE PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
F	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64177				Channel 7
G	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64178				Channel 8
H	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64179				Channel 9
I	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64180				Channel 10
J	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64181				Channel 11
K	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64182				Channel 12
L	VHF RF Mixer Grid & Osc. Coils	0Ω		83-64183				Channel 13
L12	UHF IF Coils	0Ω	0Ω	83A-64662				Includes 5.6KΩ resistor
L13	Fil. Choke	0Ω		39-12676-1				
L14	Conv. Plate	.1Ω		83A64915				
L15	1st. Video IF			13A-24203	17-4509 *	TV-127 ■		Includes 41.25MC trap
L16	2nd. Video IF	0Ω	0Ω	13A-24224	17-5004 ▲	TV-125 ▲	6232 ▲	
L17	3rd. Video IF	0Ω	0Ω	13A-24224	17-5004 ▲	TV-125 ▲	6232 ▲	
L18	Series Peaking Coil	1.6Ω		16A-22427	19-1004		4610	7.5 Microhenries
L19	Shunt Peaking Coil	7.5Ω		16A-19365	19-4400		6174	410 Microhenries
L20A	4.5MC Trap	1.8Ω						
B	Sound IF	2.8Ω		201-23729				Includes C51, C52, C55, and C56.
L21	Shunt Peaking Coil	13.5Ω		16A-24375			4651	770 Microhenries
L22	Sound Trap	1.4Ω		16A-24505	20-1004 ♦	TV-151 ♦	1469 ♦	
L23	2nd. Sound IF	.3Ω	.3Ω	201-23873	17-3495 ▲	TV-113 ▲	6203 ▲	
L24	Quadrature Coil	4.8Ω		201-23727	20-1005	TV-151	1480	
L25	Horiz. Osc.	22Ω	55Ω	12E-24440	19-1576	TV-163	6210	
L26	Horiz. Phase	35Ω		13M-24441	20-1029	MWC-1	6314	
L27	RF Choke	1.5Ω		16A-21701	19-1005		4612	8 Microhenries
L28	Isolation Coil	1.5Ω			19-1005		4612	8 Microhenries

* Drill mounting holes and add capacitor externally.
■ Cut out chassis hole and use adaptor plate and add capacitor externally.
▲ Cut out chassis hole and use adaptor plate.
♦ Drill mounting hole.

FILTER CHOKE

ITEM No.	RATINGS: TOTAL DIRECT CURRENT	RATINGS: D. C. RESISTANCE	RATINGS: INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA: FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L29	.238ADC	39.5Ω	.64HY	16A-23889	C5041	C-2996 ①	A-2328 ①	26C44 ①	C-23X ①

① Drill one new mounting hole.

SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	REPLACEMENT DATA: FIRESTONE PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.265ADC	21J-23840	1236A	MR-300	6S300	6Q4	250A	
M2	.265ADC	21J-23840	1236A	MR-300	6S300	6Q4	250A	

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA: FIRESTONE PART No.	SYLVANIA PART No.		NOTES
M3	1N82A	63-64876	1N82 or 1N82A		UHF Mixer
M4	CK706		1N60 or 1N132		Video Det.

MISCELLANEOUS

ITEM No.	PART NAME	FIRESTONE PART No.	NOTES
M5	Tuner	D21I-24245	VHF
M6	Tuner		UHF
M7	Trap	83A64917-3	VHF Ant. Input Filter
M8	Video Det. Assy.	13B-24206	Includes M4, Coils and Capacitors
M9	Switch		Fringe - Local (DPDT - Slide type)
M10	Centering Device	16M-23770	
M11	Ion Trap	16M-19706	
	Cabinet	200-24288-1	
	Knob	5B-24276-A29	UHF Channel Indicator
	Knob	5B-24282-A93	VHF Selector
	Knob	5B-24283-A93	UHF Channel Selector - VHF Fine tuning
	Knob	5B-24787-A93	Contrast
	Knob	5B-23786-A93	On-off-volume
	Knob	5B-23805-A93	Brightness, Vert. Hold and Vert. Linearity

PROPERTY OF
L. F. BLANKENSHIP
[illegible] GRADE ST.
DE[illegible], COLORADO

TROUBLE SHOOTING AIDS (cont)

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V12, V13, V14 and V15. Check waveform W11.

If Satisfactory	If Unsatisfactory
Check T2, T4A, C90, C91, C92, C88, R89 and other associated components.	Check L25, L26, C83, C84, C85, C87, C86, R86, R80, R81, R79 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V13 and V14. Check M1 and M2. Check R93, R89, C87 and other associated components.

BLOOMING

Check by substitution V13, V14 and V15. Check M1 and M2. Check R93, R89, C87, T2, T4A and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or No Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V2, V3, V4, V5, V6 and V7. Check video IF components for failure or change of value. Raster, No Sound, No Picture UHF, substitute V1.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

KEYSTONE EFFECT

Check T4 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at a time, thru the small hole in the cabinet just below the channel selector shaft.

PICTURE TUBE SAFETY GLASS CLEANING

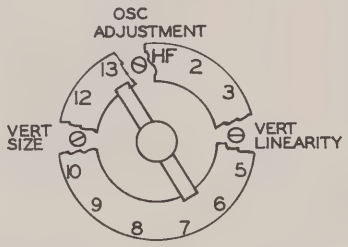
For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instruction).

SERVICE ADJUSTMENT LOCATION

Also see tube placement chart on page 5.



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

To adjust the horizontal oscillator circuit remove the rear cover and supply power to the set. Set the horizontal hold control at the mid-range position of its range and adjust the horizontal frequency slug (L26) until picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

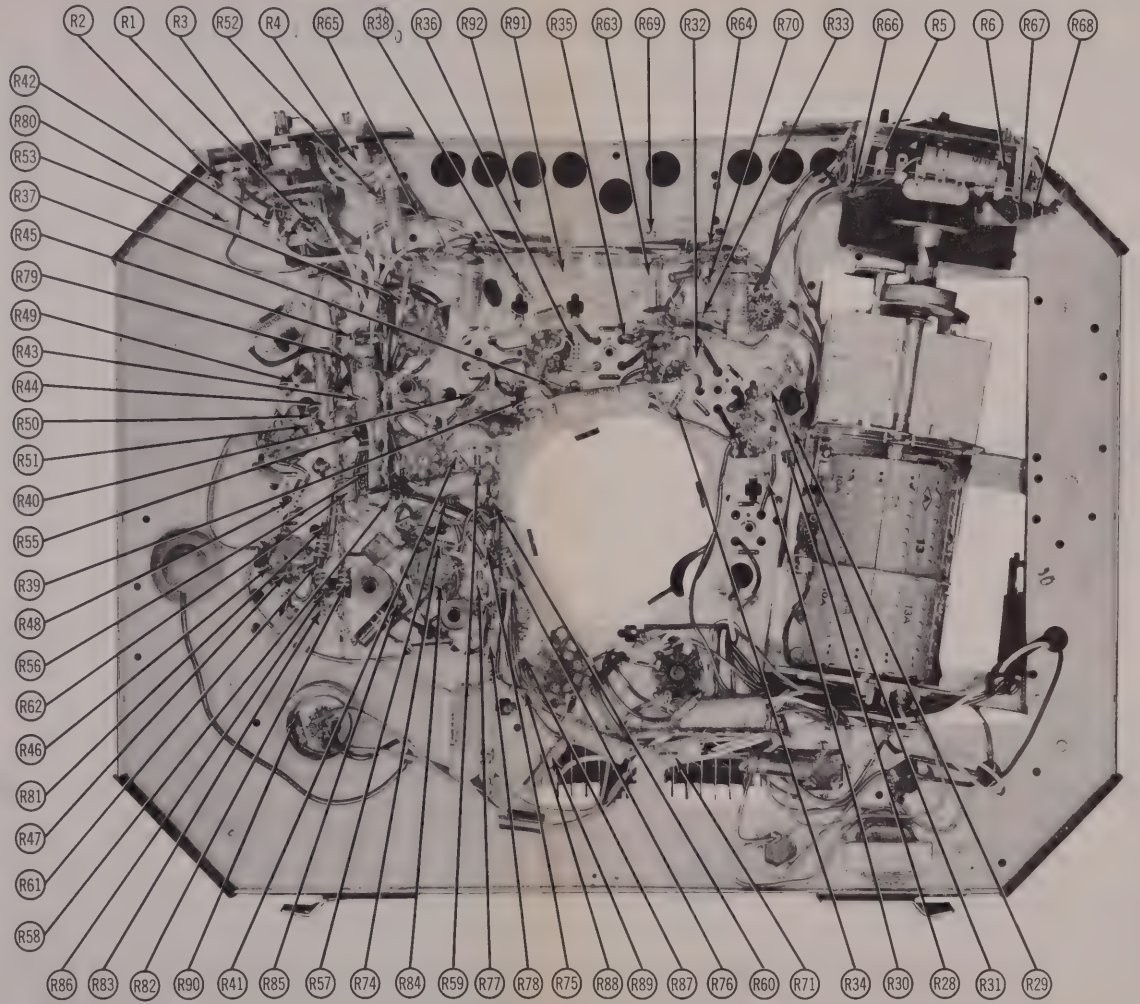
To eliminate sound IF detector buzz, adjut the buzz control (R7) located on top of the chassis for maximum volume and minimum buzz.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

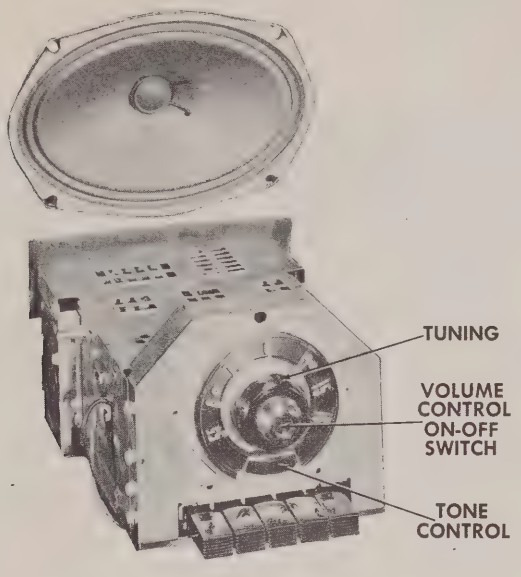
DISASSEMBLY INSTRUCTIONS

1. Remove 7 push-on type control knobs from top of cabinet.
2. Remove 5 metal screws from under side of cabinet.
3. Remove 4 metal screws. Remove rear cover.
4. Disconnect speaker leads.
5. Remove 6 metal screws located on the sides and top of safety glass frame.
   Remove 2 metal screws located under top control knobs.
6. Slide picture tube and chassis from front of cabinet.
7. Remove 2 speaker nuts. Remove speaker.



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



TRADE NAME	Ford Model 5BF(FDH-18805-B1) For 1955 Ford Cars)
MANUFACTURER	Bendix Radio, Div. Of, Bendix Aviation Corp. Baltimore, Maryland
TYPE SET	Battery Operated Custom Built AM Superheterdyne Automatic Receiver
TUBES (Six)	Types 6BA6 RF. Amp., 6BE6 Conv, 6AU6 IF Amp, 6AVC-AF Amp., 6AQ5 Output, 6x4 Rectifier.
POWER SUPPLY	6Volt Storage Battery RATING 5.7 Amp@ 6.3 Volts DC
TUNING RANGE—BROADCAST	540 KC-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be on higher than necessary to obtain an output reading. Use an insulated aligment screwdriver for adjusting.
Set tone control to "Normal".
Steps 4, 5, 6, and 7 are necessary only when core or tuning coil has been replaced.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	Fig 1	The dummy antenna to ant. receptacle	265 KC (400∿ mod)	High frequency end of dial	Across voice coil	A1, A2, A3, A4,	Adjust for maximum output in order given.
2.	"	"	1605KC	"	"	A5, A6, A7,	"
3.				1600KC	"	A7	Readjust after installed in car with antenna extended fully and toned to weak station in near 1600KC
4.				High frequency end of dial	"	A8, A9, A10	Adjust tuner cores out of coils but still within forms, for maximum output.
5.	Fig 1	Thru dummy antenna to ant. receptacle	1605KC	"	"	A5, A6	Adjust for maximum output in order given.
6	"	"	1200KC	1200KC	"	A8, A9, A10	"
7.	"	"	1605KC	High frequency end of dial	"	A5, A6, A7	"

PUSHBOTTON ADJUSTMENT

1. Pull pushbutton until it stops but do not take off of shaft (unless for replacement).
2. Tune to desired frequency manually.
3. Push pushbutton on shaft until it stops and releases.

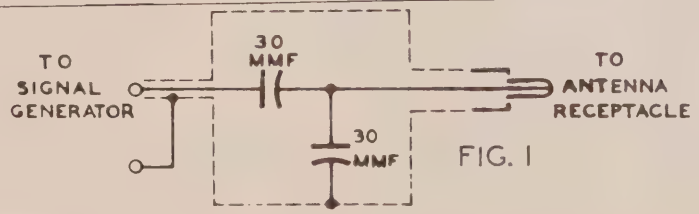


FIG. 1

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PARTS LIST AND DESCRIPTIONS

FORD
MODEL 5BF (FDH-18805-B1)

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: BENDIX PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp	6BA6	6BA6	7CH	
V2	Converter	6BE6	6BE6	7CH	
V3	IF Amp	6AU6	6AU6	7BK	
V4	Det-AVC-AF Amp	6AV6	6AV6	7BT	
V5	Audio Output	6AQ5	6AQ5	7BZ	
V6	Rectifier	6X4	6X4	5BS	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: BENDIX PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	■20	350	C-220108-5			FP333.6	TM-3028	T-465	
B	♦10	300							
C	20	25							
C2	100		C-220095-3	D6-101	GP1K-101	UC-531		K-1310	
C3	180		C-220099-22	TCZ-180	NP0-338-181			KR-1318	
C4	.1	200	C-220098-8	DF-104		PT401	IMP2-P1	330201	
C5	8.2				NP0A-8R2				
C6	51			TCN-51	N750K-510				
C7	.1	400	C-220098-6	DF-104		PT401	IMP4-P1	330401	
C8	.015	200	C-220098-20	DD16-153	821-015	PT6115	IMP6-S15	3306115	
C9	.0025	200	C-220098-38	D6-252	GP2-333-252	PT6222	IMP6-D22	3306225	
C10	.02	200	C-220098-28	DF-203	817-02	PT412	IMP2-S2	330212	
C11	150		C-220095-23	D6-151	GP2K-151	UC-5315		K-1315	
C12	.01	400	C-220098-12	D6-103	GP3-333-103	PT411	IMP4-S1	330411	
C13	.004	1600	C-220098-17	D16-402		PT624			
C14	.5	100	C-220098-10			RF480	CT2-P5	330205	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	C-219656 -1	Q13-133X	A47F3 -500K		UT-430	Vol. & Sw. (Tap ⓐ 150KΩ)
B	Shaft		Not Req	Not Req	RS-3		Not Req	Attach to R1A
C	Switch		Not Req	76-2	SWE-20		US-27	Attach to R1B
R2	2Meg	½	C-219662-1					Tone
R3	3000Ω	1	C-219555-8		39-3000			Sensitivity

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	NOTES
R4	1Meg	½	C-220051B-105M	BTS-1Meg	
R5	10KΩ	1	C-220051C-103K	BTA-10K	
R6	22Meg	½	C-220051B-226M	BTS-22Meg	
R7	68Ω	½	C-220051B-680M	BTS-68	
R8	47KΩ	½	C-220051B-473M	BTS-47	
R9	220Ω	½	C-220051B-221M	BTS-220	
R10	15KΩ	2	C-2205510-153M	BTB-15K	
R11	1.5Meg	½	C-220051B-155M	BTS-1.5Meg	

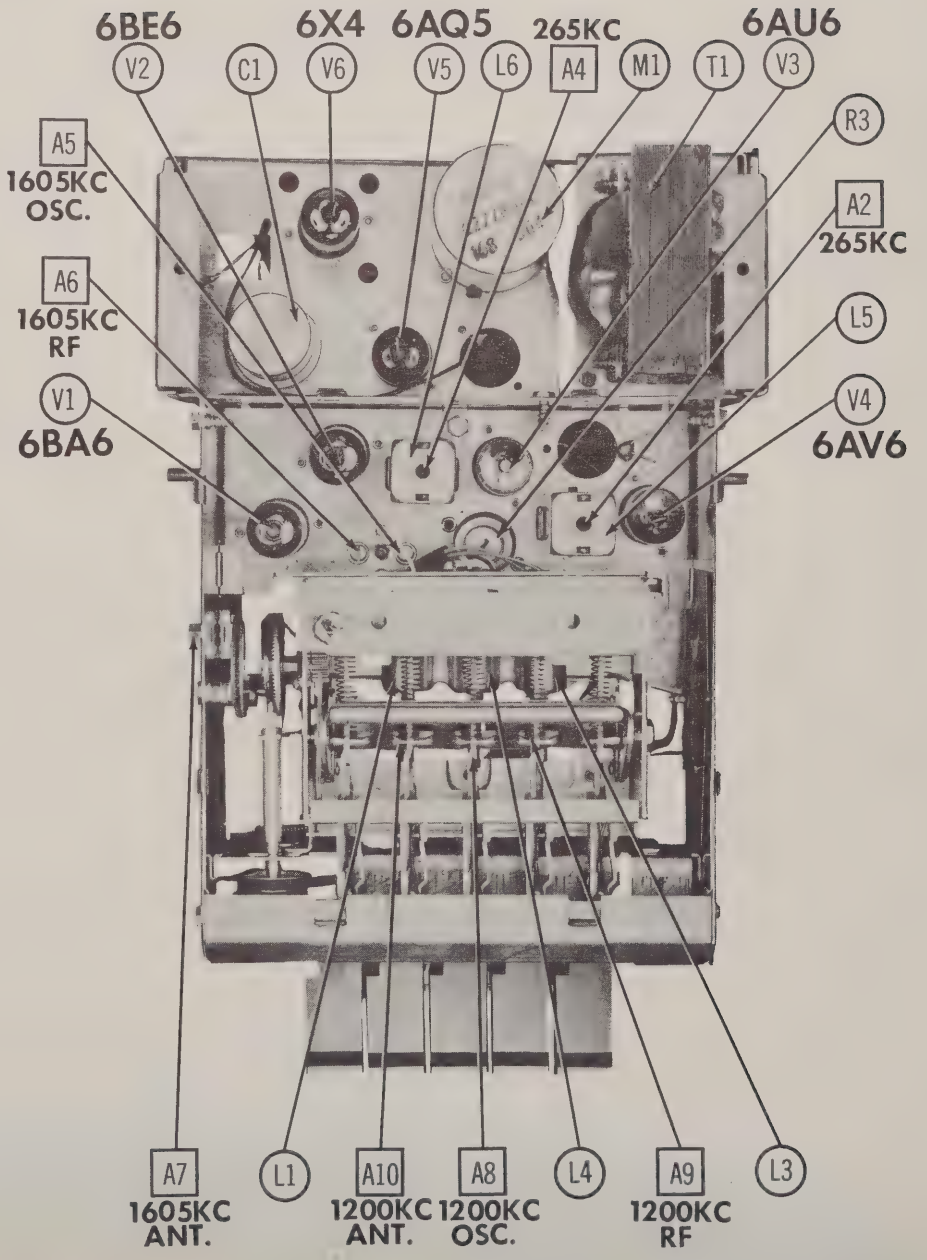
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: BENDIX PART No.	IRC PART No.	NOTES
R12	10Meg	½	C-220051B-106M	BTS-10Meg	
R13	1Meg	½	C-220051B-105M	BTS-1Meg	
R14	22KΩ	½		BTS-22K	
R15	150KΩ	½		BTS-150K	
R16	270Ω	1	C-220051C-271K	BTA-270	
R17	1.2KΩ	1	C-220051C-122K	BTA-1200	
R18	100Ω	½	C-220051B-101M	BTS-100	
R19	100Ω	½	C-220051B-101M	BTS-100	

TRANSFORMER (VIBRATOR)

ITEM No.	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	RATING: SEC. 3	REPLACEMENT DATA: BENDIX PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	6.3VCT ⓐ3.4A	420VCT .052ADC			C-291787-1		P-3068①			

① Use universal mounting feet.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA BENDIX PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	6KΩ	3.5Ω	C-291788-1	Z1113	A-2930	A-3877	24S51	S-3X	

SPEAKER

ITEM No.	RATINGS SIZE	FIELD	V. C. IMP.	REPLACEMENT DATA BENDIX PART No.	QUAM PART No.	NOTES
SP1	6"x9"	PM	3.5Ω	L222081-1 C-282634-3①	69A2	① Alternate 6"x9" Speaker.

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA BENDIX PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	Ant. Coil	12Ω		C-686044-2				Part of complete assey. Part # OR-220964-1
L2	Image Trap Coil	4.2Ω		C-215818-7	19-7047*		4630*	125 Microhenries wound on 18K Resistor
L3	RF Coil	5.5Ω		C-686044-2				Part of complete assembly part # OR-220964-1
L4	Osc. Coil	.6Ω	2.8Ω	C-686044-2				Part of complete assembly Part # OR-220964-1
L5	Input IF	48Ω	44Ω	C-291714-5	16-6752	BC-350	12-H1	
L6	Output IF	39Ω	39Ω	C-291706-6	16-6745	BC-354	12-H6	
L7	Fil. Choke	.2Ω		C-216162-3				125 Microhenries
L8	Vib. Hash Choke	0Ω		C-216057-5	19-4215			12 Microhenries

* Parallel with 18KΩ Resistor

VIBRATOR

ITEM No.	TYPE	INPUT VOLTS	FREQUENCY	REPLACEMENT DATA BENDIX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	RADIART PART No.	NOTES
M1	Interrupter	6.3V	115Ω	C-222810-1	5301	859	5301	

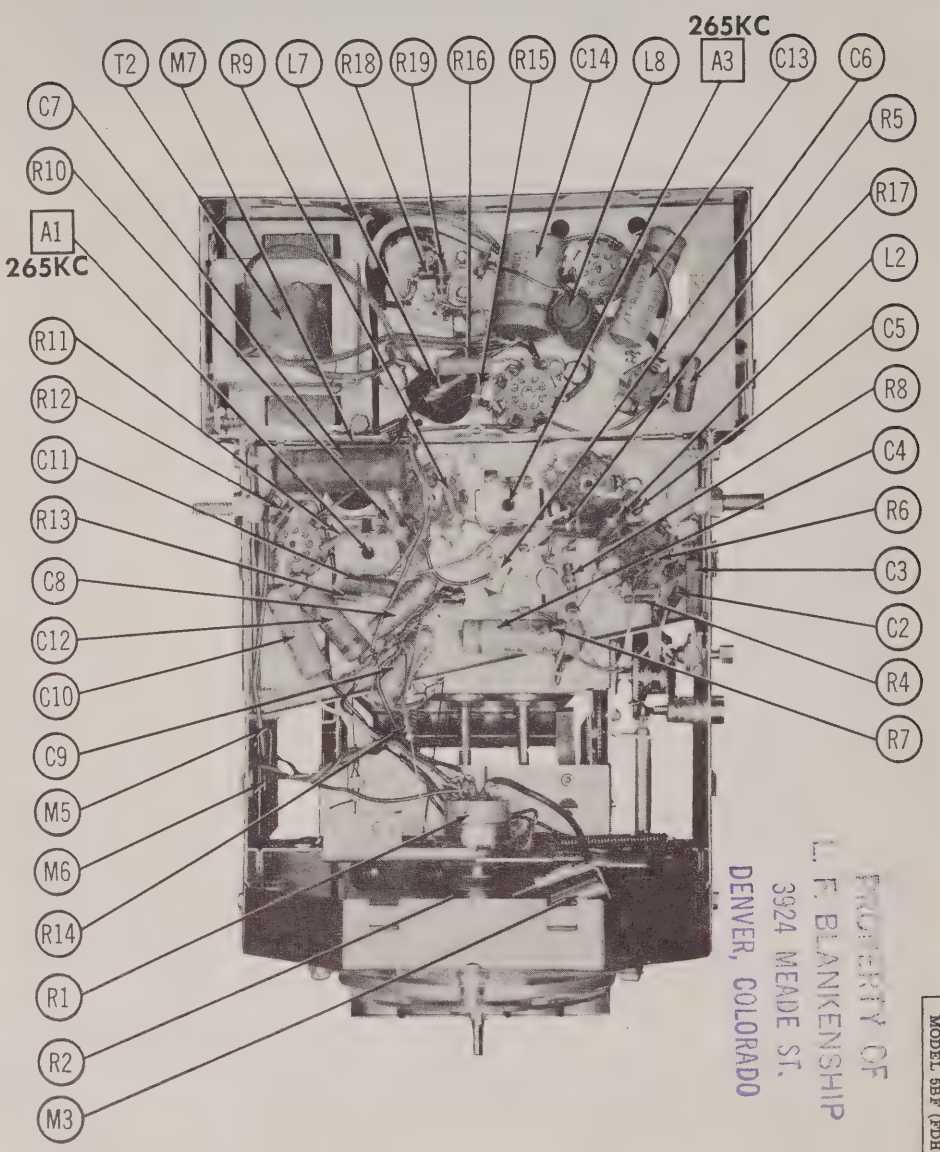
FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA BENDIX PART No. FUSE	BENDIX PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M2	SFE	9A 32V	C-221613-9	C-221627-1	307009 (SFE9)	155009	SFE9	HRH

MISCELLANEOUS

ITEM No.	PART NAME	BENDIX PART No.	NOTES
M3	Dial Light		#44
M4	Tuner Assy.	OR220964-1	Permeability-Late Series
	Tuner Assy.	OR220932-1	Permeability-Late Series
M5	Spark Plate	C-220267-5	"A" Lead
M6	Spark Plate		Instrument Panel Lights Lead
M7	Spark Plate	C-220267-1	Filament.
A5, A6	Trimmer Cap.	C-219085-2	Dual-Osc. Trimmer (370-445MMF) & RF Trimmer (120-450MMF). Also includes 100MMF Fixed Caps.
A7	Trimmer Cap.	C-219083-1	Ant. Trimmer (4-75MMF)
	Knob	C-237087-1	Tuning
	Knob	C-282960-1	On-Off-Volume
	Knob	L-685028-1	Tone
	Push Button	C-294613-2	5 Used
	Dial Window	OR-221963-1	
	Sub-Dial	L-676030-1	
	Dial Pointer	L-247393-1	

CHASSIS—BOTTOM VIEW



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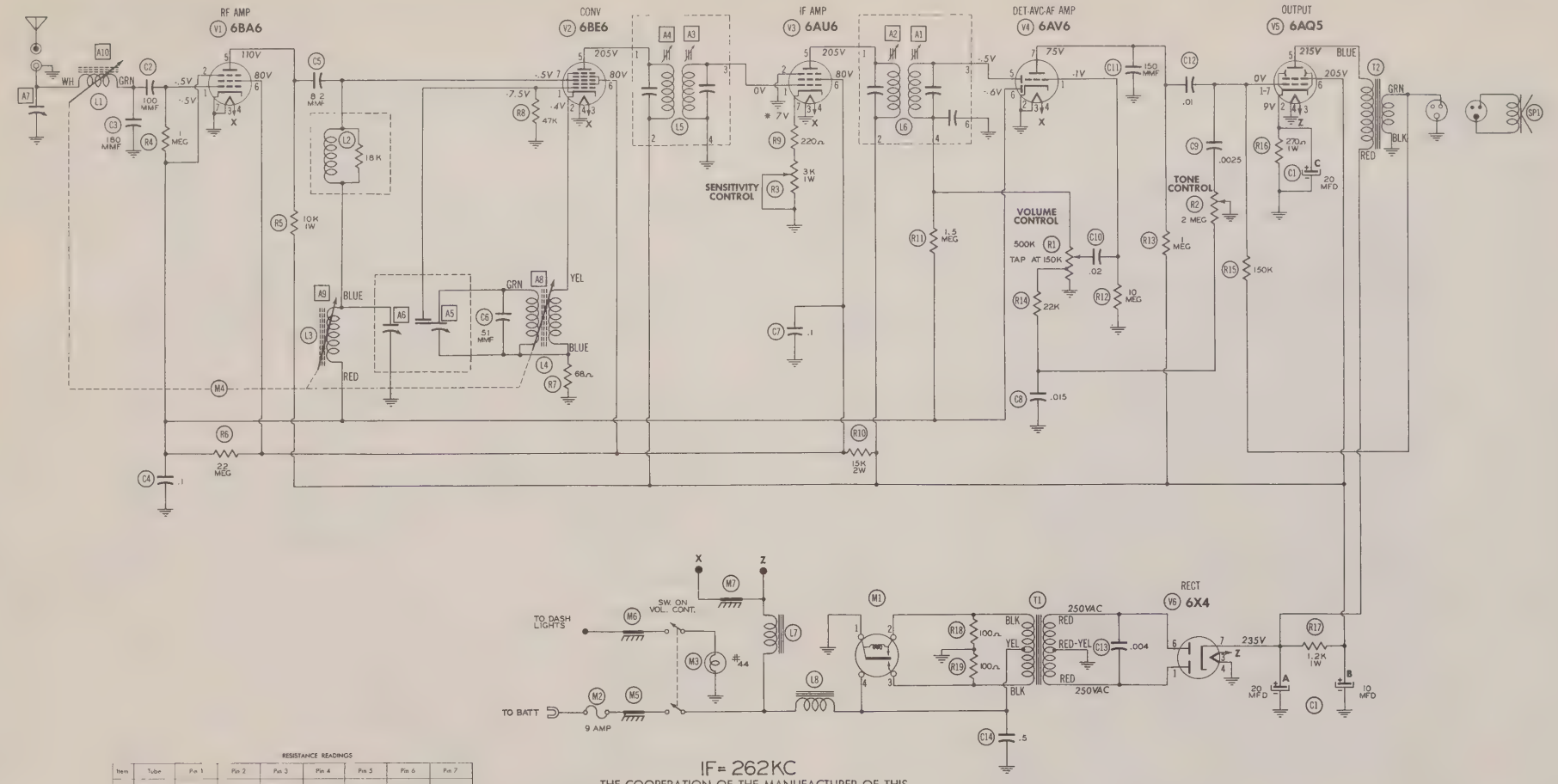
3924 MEADE ST.
DENVER, COLORADO

FORD
MODEL 5BF (FDH-18805-B1)



IF = 262KC

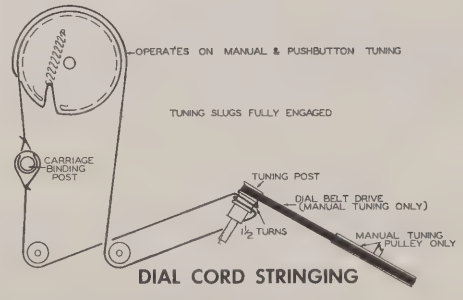
THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	6BA6	3Meg	2Meg	0Ω	.5Ω	†1.2KΩ	†15KΩ	0Ω
V 2	6BE6	47KΩ	.7Ω	.5Ω	0Ω	†1.2KΩ	†15KΩ	2Meg
V 3	6AU6	40Ω	0Ω	0Ω	.5Ω	†1.2KΩ	†15KΩ	*220Ω
V 4	6AV6	10Meg	0Ω	0Ω	.5Ω	500KΩ	2Meg	†1Meg
V 5	6AQ6	150KΩ	270Ω	.5Ω	0Ω	†800Ω	†1.2KΩ	150KΩ
V 6	6X4	400Ω	TP	.5Ω	0Ω	NC	400Ω	5Meg

† MEASURED FROM PIN 7 OF V3
*MEASURED IN MAXIMUM SENSITIVITY POSITION
TP TIE POINT
NC NO CONNECTION.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 6.3 volts for voltage readings.
5. Nominal tolerance on components values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.



DIAL CORD STRINGING

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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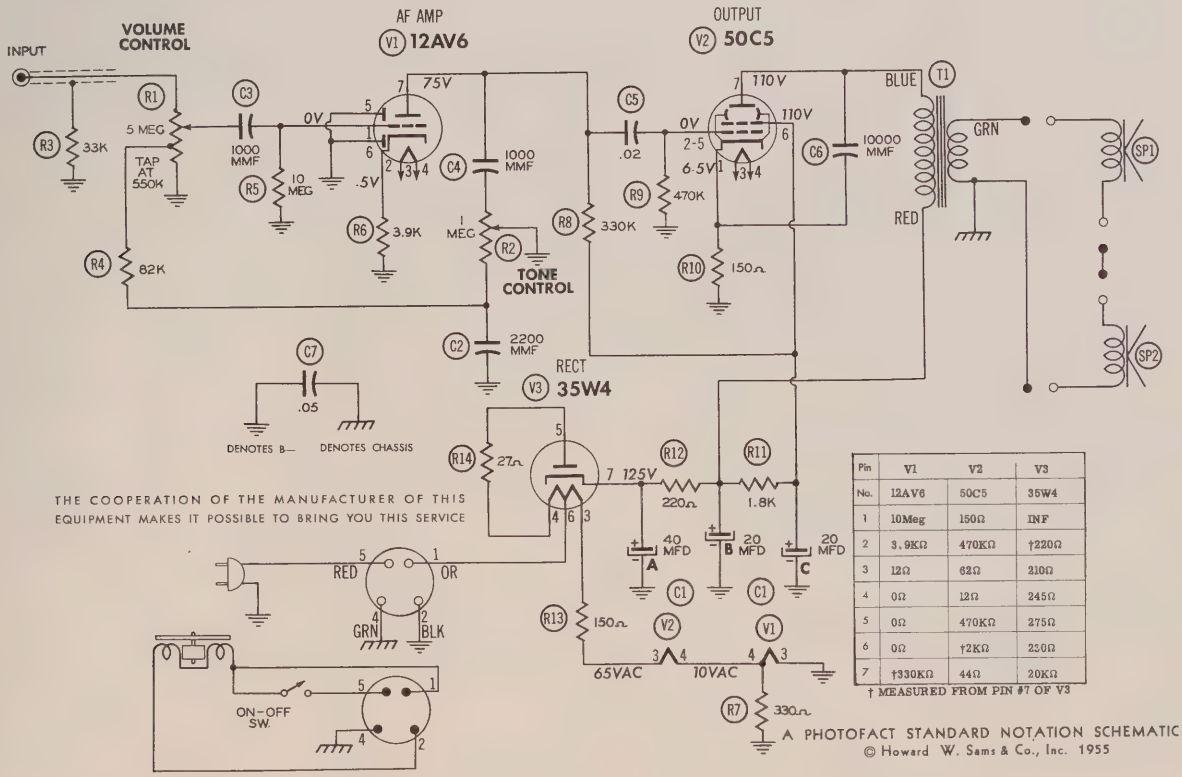
MOTOROLA
MODEL 34F1 (Ch. HS-444)

L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

MOTOROLA
MODEL 34F1 (Ch. HS-444)

TRADE NAME	Motorola Model 34F1 (Ch. HS-444)
MANUFACTURER	Motorola, Inc., 4545 Augusta Blvd., Chicago 51, Ill.
TYPE SET	AC Operated Phono Amplifier With 3 Speed Automatic Record Changer
TUBES (Three)	Types 12AV6 AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING .22 Amp. @ 117 Volts AC

FOR SERVICE INFORMATION ON RECORD CHANGER UNIT MOTOROLA MODEL C4RC-SEE SIMILAR CRESCENT 500 SERIES IN PHOTOFACT SET #197 - FOLDER #4 OR RECORD CHANGER MANUAL CM-5.



Pin	V1	V2	V3
No.	12AV6	50C5	35W4
1	10Meg	150Ω	INF
2	3.9KΩ	470KΩ	†220Ω
3	12Ω	62Ω	210Ω
4	0Ω	12Ω	245Ω
5	0Ω	470KΩ	275Ω
6	0Ω	†2KΩ	250Ω
7	†330KΩ	44Ω	20KΩ

† MEASURED FROM PIN #7 OF V3

THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: MOTOROLA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	AF Amplifier	12AV6	12AV6	7BT	
V2	Output	50C5	50C5	7CV	
V3	Rectifier	35W4	35W4	6BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: MOTOROLA PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	40	150	23B484234			TCT3114	TDL-403020-150	FMT-310	
B	20	150							
C	20	150							
C2	2200		21K121882	DD-222	812-0022	DC-5222	IMP4-D22	3304222	
C3	1000		21A121678	DD-102	811-001	DC-521	IMP4-D1	330421	
C4	1000		21A121678	DD-102	811-001	DC-521	IMP4-D1	330421	
C5	.02	200	8R121003			PT412	IMP2-S2	330212	
C6	10000		21R482726	DD-103	811-01	DC-511	IMP4-S1	330411	
C7	.05	200	8R121005	DF-503		PT415	IMP2-S5	330215	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: MOTOROLA PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1	5Meg	½	18A632189					Volume - Tapped @ 500KΩ
R2	1Meg	½	18A632190	Q14-137		B-68	U-54	Tone

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MOTOROLA PART No.	IRC PART No.	NOTES
R3	33KΩ	½	6R6012	BTS-22K	
R4	82KΩ	½	6R5644	BTS-82K	
R5	10Meg	½	6R2109	BTS-10Meg	
R6	3900Ω	½	6R5659	BTS-3900	
R7	330Ω	½	6R6010	BTS-330	
R8	330KΩ	½	6R6014	BTS-330K	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: MOTOROLA PART No.	IRC PART No.	NOTES
R9	470KΩ	½	6R6032	BTS-470K	
R10	150Ω	½	6R6373	BTS-150	
R11	1800Ω	½	6R2089	BTS-1800	
R12	220Ω	1	6R6173	BTA-220	
R13	150Ω	5	17A632208		
R14	27Ω	½	6R5683	BTS-27	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.4KΩ	7.2Ω	25C632209-A	Z1007	A-2902	A-3849			

SPEAKER

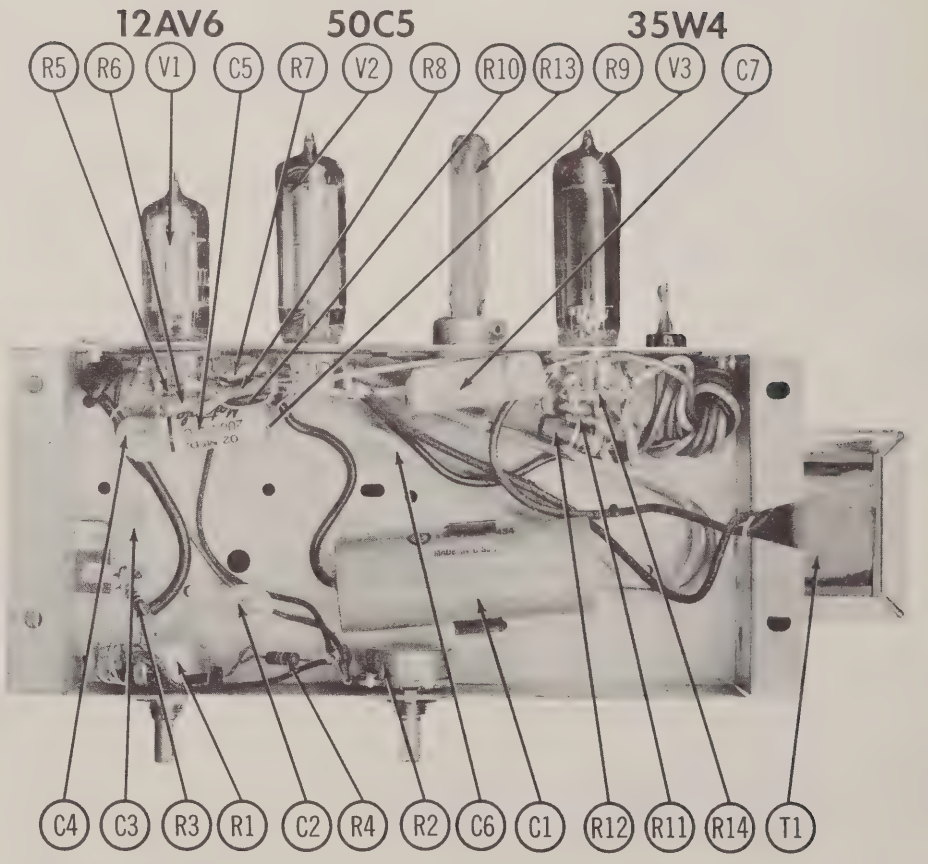
ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: MOTOROLA PART No.	QUAM PART No.	NOTES
SP1	5 1/4"	PM	3.6Ω	50C632188	52A1	
SP2	5 1/4"	PM	3.6Ω	50C632188	52A1	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: MOTOROLA PART No.	ASTATIC PART No.: CARTRIDGE	ASTATIC PART No.: NEEDLE	ELECTRO-VOICE PART No.: CARTRIDGE	ELECTRO-VOICE PART No.: NEEDLE	REMARKS
M1		55-T	GD-J	47	0-1 or S-1 & 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

PHONO NEEDLE

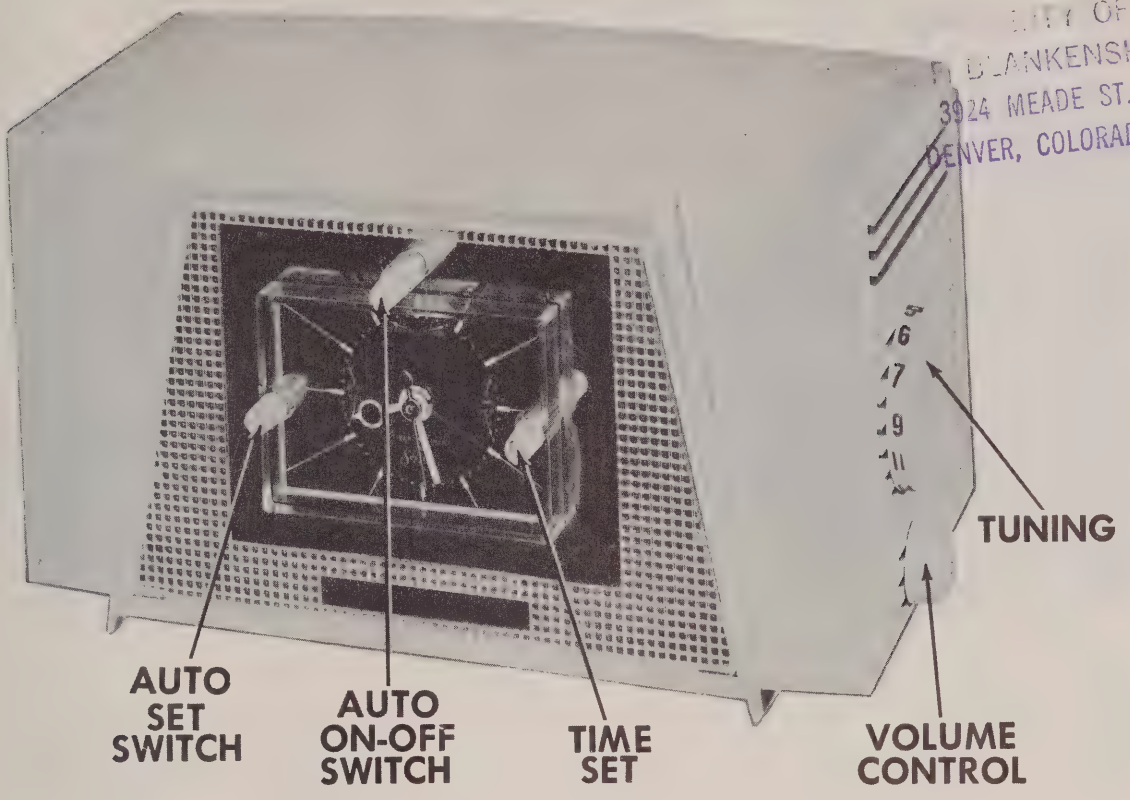
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA: MOTOROLA PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M2		†S-66 or ♦†S-66SD or ♦S-66D	†AC-434 or ♦†AC-434D1 or †♦AC-434D2 or ♦AC-434D	†W-75TPS or ♦† W-75DS or ♦W-75TPD	* Metal † Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
	Cabinet	16E632183	Portable
	Handle	55K632670	Plastic
	Knob	36K632088	Control (2 used)
	Name Plate	1A632108	

CITY OF
R. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



OLYMPIC
MODEL 402

TRADE NAME	Olympic Model 402
MANUFACTURER	Olympic Radio & Tel. Corp. 34-01 38th Ave. Long Island City 1, N. Y.
TYPE SET	AC Operated AM Superheterdyne Receiver With Electric Clock
TUBES (Five)	Types 12BA6 RF Amp, 12AU6 Conv., 12AT6 Det-AVC AF Amp,. 50C5 Output.
POWER SUPPLY	105-120 Volts AC-60 Cycles RATING . 22 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	535KC-1650KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment aligment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a . 1MFD capacitor in series with low side of signal generator and chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1MFD	High side to ant. Terminal lug. Low side to B-.	455KC	Tuning gang Fully open	Across Voice coil	A1, A2	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001MFD to reduce hum modulation.
2.		Loop	1650 KC	"	"	A3	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
3.		"	1500KC	1500KC	"	A4	"
4.		"	600KC	600KC	"		Check tracking IF necessary repeat steps 2, 3, and 4.

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PARTS LIST AND DESCRIPTIONS

OLYMPIC MODEL 402

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: OLYMPIC PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp	12BA6	12BA6	7BK	
V2	Converter	12AU6	12AU6	7BK	
V3	Det-AVC-AF Amp	12AT6	12AT6	7BT	
V4	Audio Output	50C5	50C5	7CV	
V5	Rectifier	35W4	35W4	5BQ	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	70	150	150-118						Red
B	30	150				TCD-498	TDL-8030-150	FMD-303	Blue
C2	.05	400	152-104	DF-503					
C3	50		156-107	D6-500	831-500			KR-1450	
C4	100		156-102	D6-101	GP1K-101	UC-531		K-1310	
C5	.002	100	152-101	D6-202	GP2-333-202	PT622	IMP6-D2	330622	
C6A	5000								
B			♦166-109	♦PC-71	♦1406-02				
C	250								
C7	10000		158-102	DD-103	811-01	DC511	IMP6-S1	330611	
C8	.05	400	152-109	DF-503		PT415	IMP4-S5	330415	
C9	.1	400	152-108	DF-104		PT401	IMP4-P1	330401	

♦ Stems C6A, C6B, C6C, R7A and R7B are combined in one unit. When replacing items seperately, items C6B and C6C should total 250 MMF.

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: OLYMPIC PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	120-118	Q13-137	A47-1Meg-KSS-3	BSK-70	U-53	Volume
B	Shaft		Not Req	Not Req		Not Req	Not Req	Attach to R1A

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: OLYMPIC PART No.	IRC PART No.	NOTES
R2	47Ω	½	180-103	BTS-47	
R3	3300Ω	½		BTS-3300	Note 1
R4	2.2Meg	½	180-107	BTS-2.2Meg	
R5	2.2 Meg	½	180-107	BTS-2.2Meg	

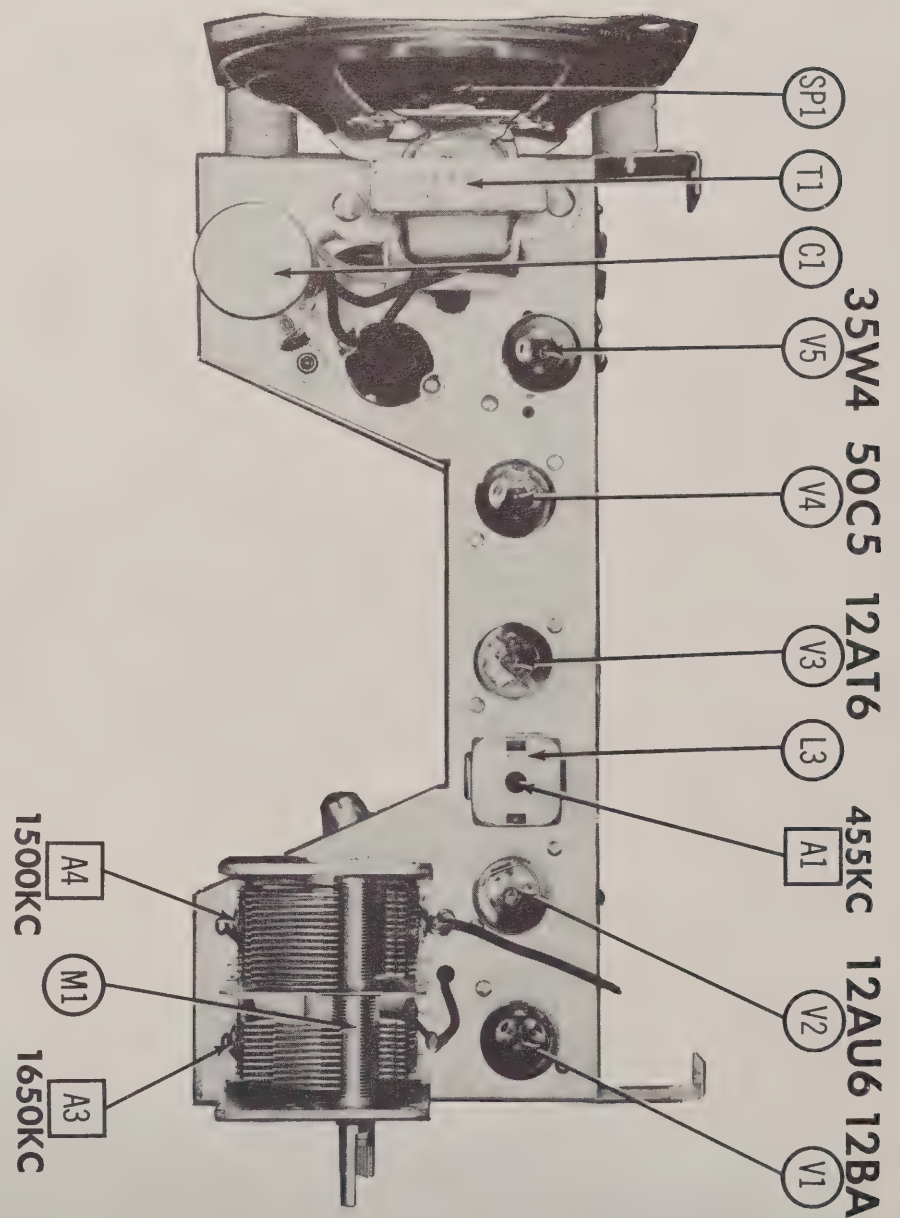
ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: OLYMPIC PART No.	IRC PART No.	NOTES
R6	10Meg	½	180-123	BTS-10Meg	
R7A	250KΩ	½	♦166-109	BTS-250K	
B	500KΩ	½		BTS-500K	
R8	150Ω	½	180-111	BTS-150	
R9	1500Ω	1	180-157	BTA-1500	

♦ Items R7A, R7B, C6A, C6B & C6C are combined in one unit
Note 1. Some versions use A4700Ω resistor in this application.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: OLUMPIC PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.4KΩ	3.4Ω	138-109					S-16X	

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	OLYMPIC PART No.	QUAM PART No.	
SP1	4"	PM	3.4Ω	175-115	4A1	

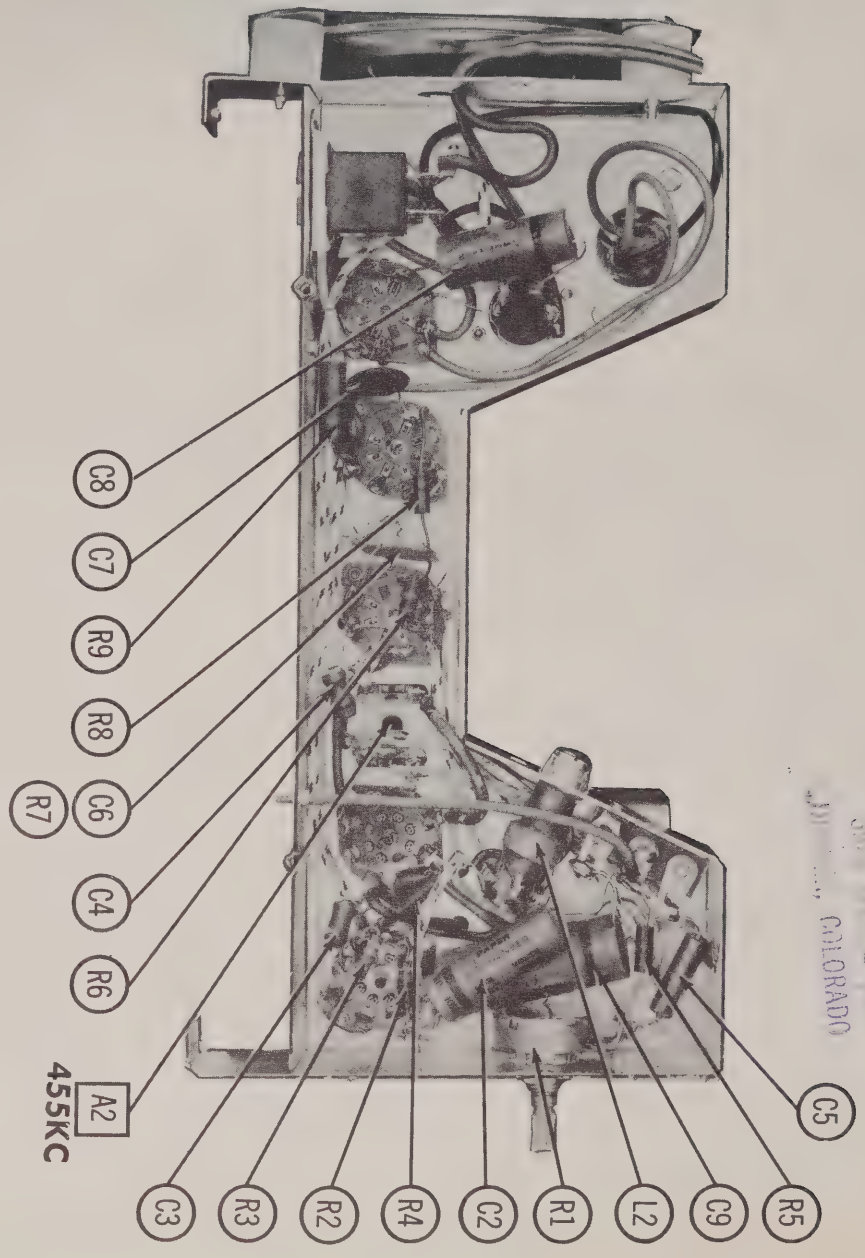
COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	OLYMPIC PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant	2.6Ω		225-116				Includes cabinet back
L2	Osc Coil	1.4Ω	5.5Ω	136-111				Tertiary winding=2.8Ω
L3	If Trans.	26Ω*	26Ω	130-106				*Tapped@ .9Ω

MISCELLANEOUS

ITEM No.	PART NAME	OLYMPIC PART No.	NOTES
M1	Tuning Cap	160-104	2 Gang (25-470MMF, 15-180MMF)
M2	Clock	207-101	
	Cabinet	210-104-W	Walnut
	Cabinet	210-104-V	Ivory
	Cabinet	210-104-P	Pink
	Cabinet	210-104-B	Blue
	Cabinet	210-104-C	Chartreuse
	Knob	220-103-W	Tuning-Walnut
	Knob	220-103-V	Tuning-Ivory
	Knob	220-103-P	Tuning-Pink
	Knob	220-103-B	Tuning-Blue
	Knob	220-103-C	Tuning-Chartreuse
	Knob	220-103-W	On-Off-Volume-Walnut
	Knob	220-104-V	On-Off-Volume- Ivory
	Knob	220-104-P	On-Off-Volume-Pink
	Knob	220-104-B	On-Off- Volume-Blue
	Knob	220-104-C	On-Off-Volume- Chartreuse
	Knob	207-102	Clock-3 Used
	Dial	206-117	Clock

CHASSIS—BOTTOM VIEW



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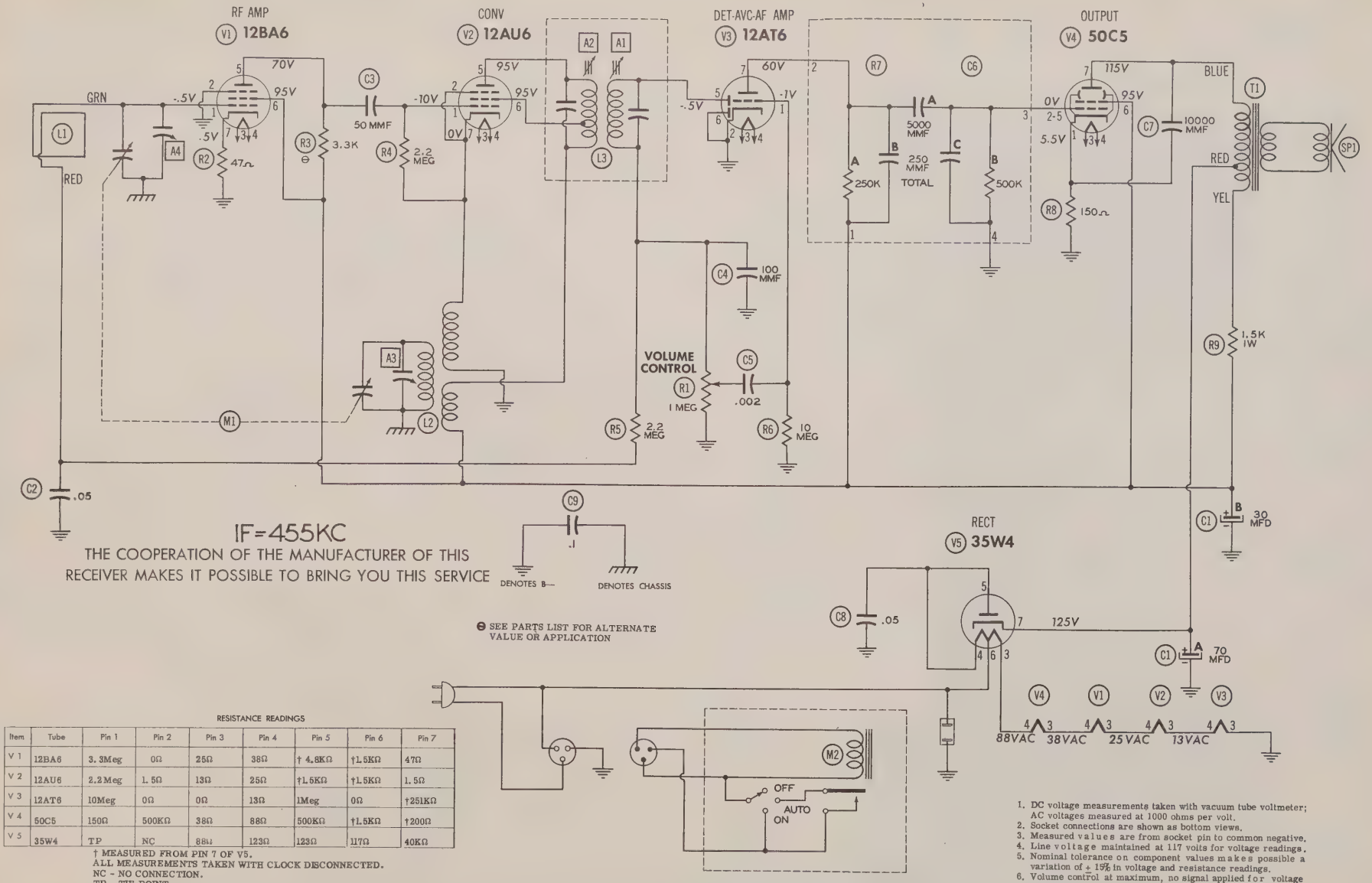

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V 1	12BA6	3.3Meg	0Ω	25Ω	38Ω	† 4.8KΩ	†1.5KΩ	47Ω
V 2	12AU6	2.2Meg	1.5Ω	13Ω	25Ω	†1.5KΩ	†1.5KΩ	1.5Ω
V 3	12AT6	10Meg	0Ω	0Ω	13Ω	1Meg	0Ω	†251KΩ
V 4	50C5	150Ω	500KΩ	38Ω	88Ω	500KΩ	†1.5KΩ	†200Ω
V 5	35W4	TP	NC	88Ω	123Ω	123Ω	117Ω	40KΩ

† MEASURED FROM PIN 7 OF V5.
ALL MEASUREMENTS TAKEN WITH CLOCK DISCONNECTED.
NC - NO CONNECTION.
TP - TIE POINT.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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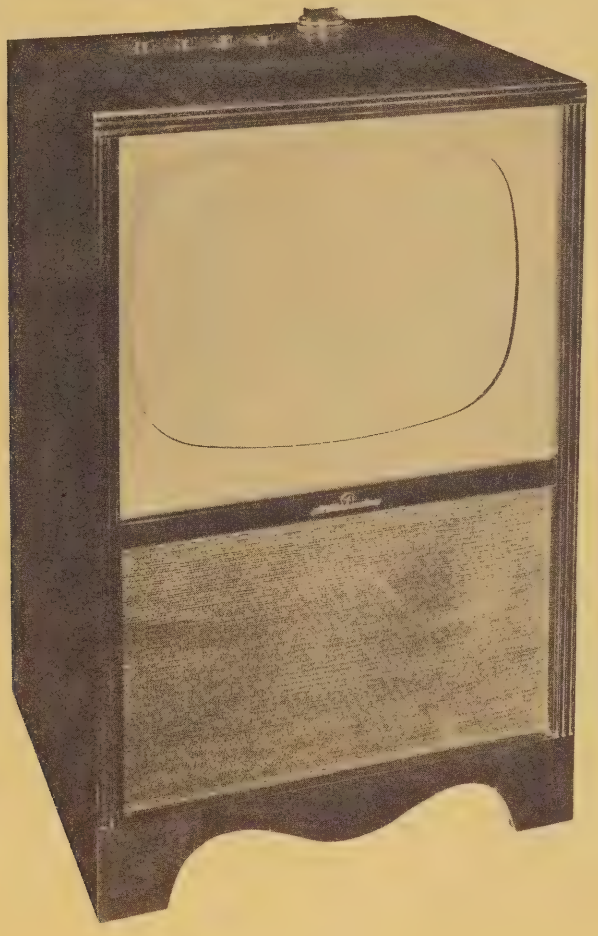

MODEL 54CM21

PHILHARMONIC MODELS
54CL021, 54CM21, 54TW21

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PHILHARMONIC MODELS 54CLO21, 54CM21, 54TW21

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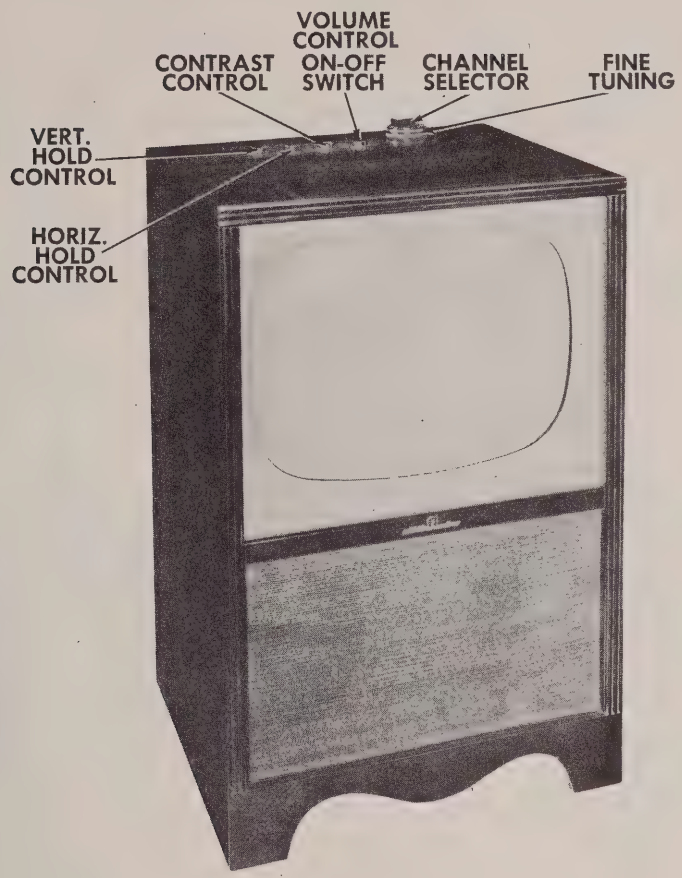

PHILHARMONIC MODEL 54CM21

TRADE NAME	Philharmonic Models 54CLO21, 54CM21, 54TW21
MANUFACTURER	Philharmonic Radio & Television Corp., 235 Jersey Ave., New Brunswick, N.J.
TYPE SET	Television Receiver
TUBES	Seventeen
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 1.44 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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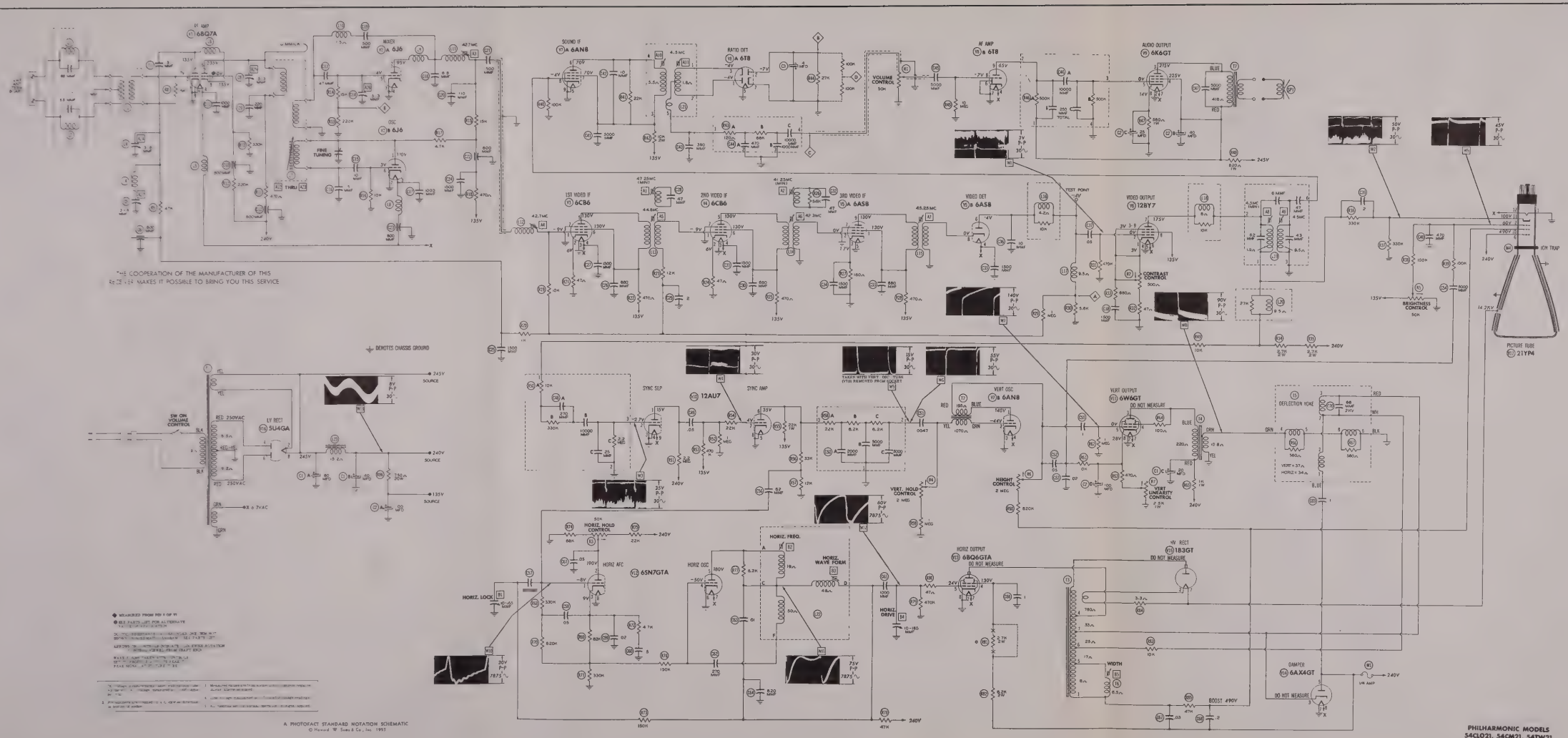
PHILHARMONIC MODELS
54CLO21, 54CM21, 54TW21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54CL021, 54CM21, 54TW21
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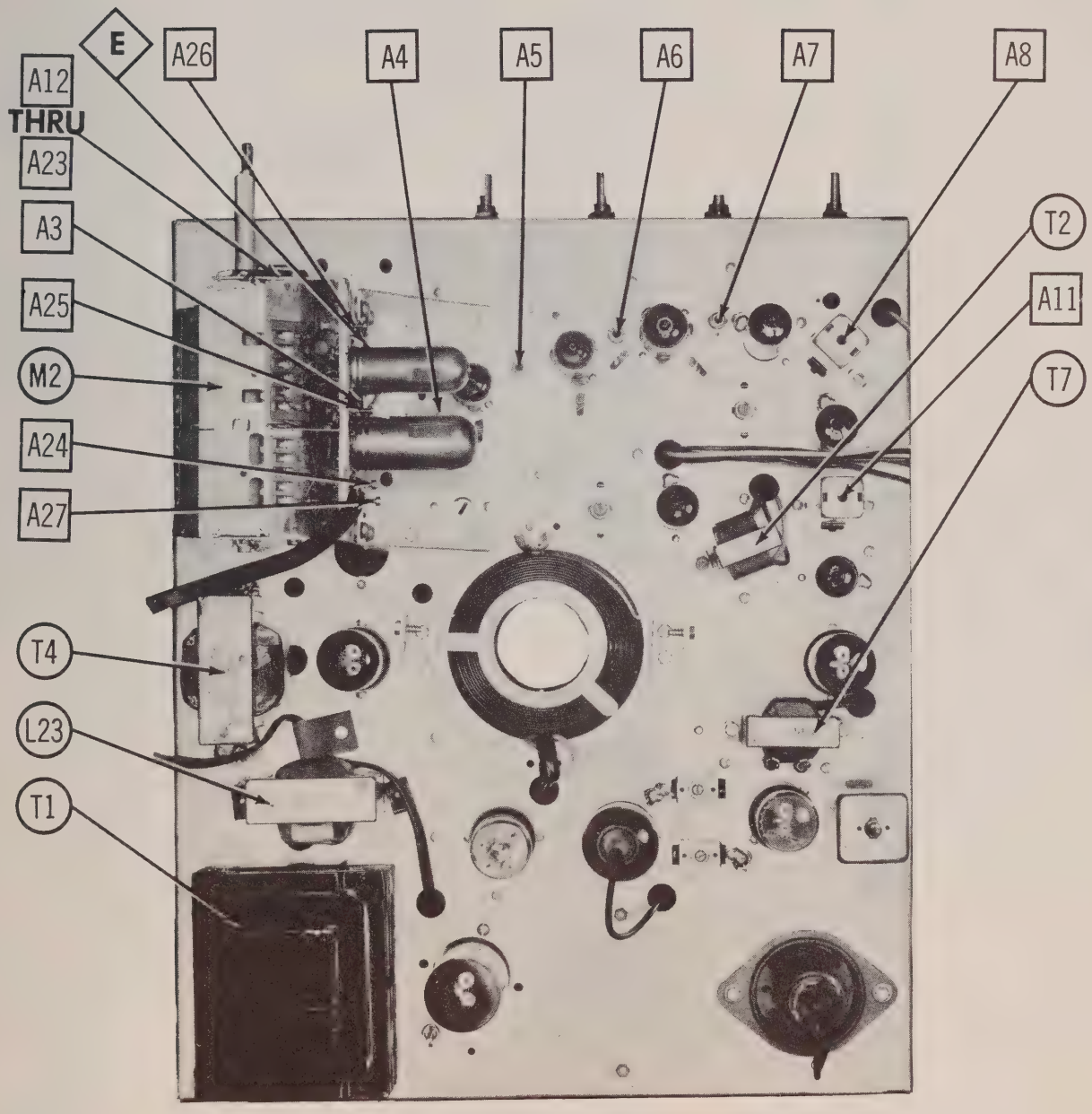

CHASSIS TOP VIEW

SET 286 FOLDER 9

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CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

PHILHARMONIC MODELS
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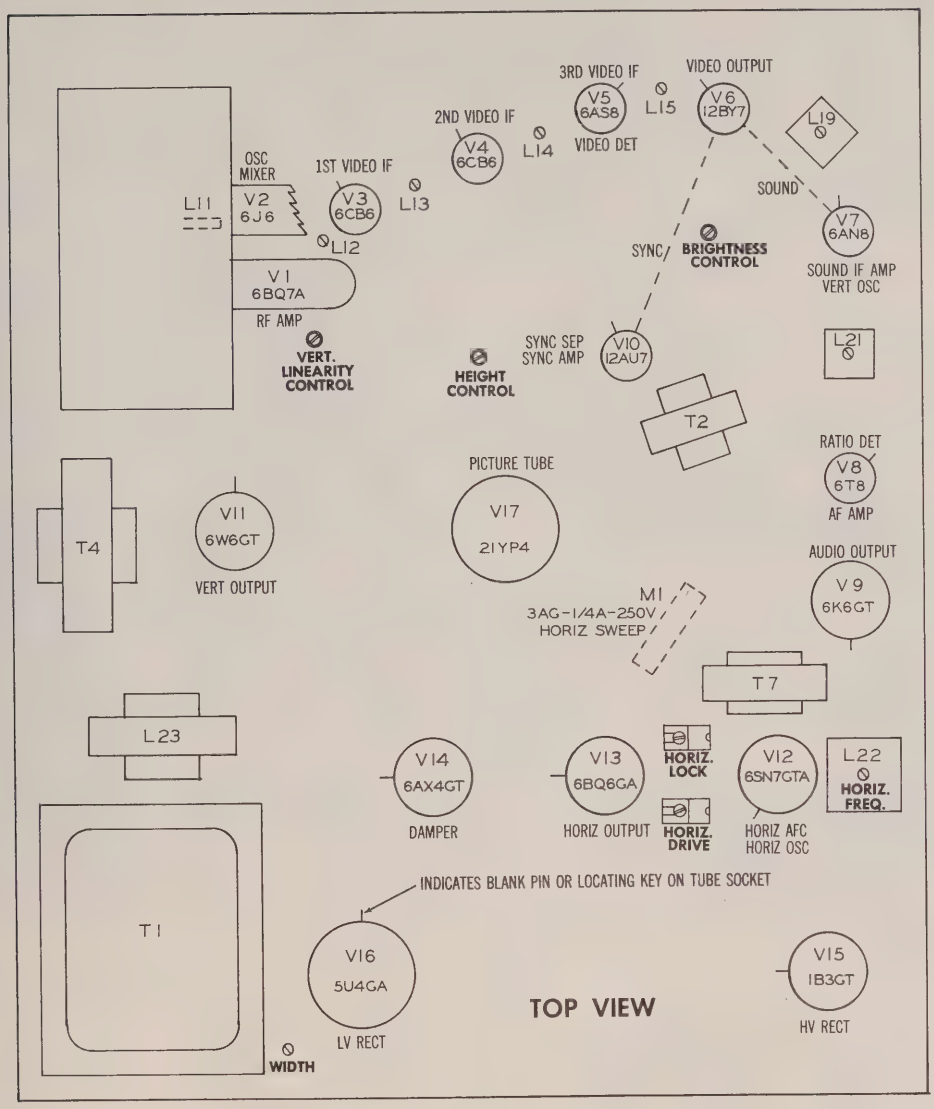
TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V16

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster -V6, V17
Has pic, no sound - V7, V8, V9

SYNC FAILURE
No vert. sync - V7, V10
No horiz. sync - V10, V12
No vert. or horiz. sync - V10

SWEEP FAILURE
No raster, has sound - V12, V13, V14, V15, V17, Fuse (M1)
No vertical deflection - V7, V11
Poor vert. linearity or foldover - V7, V11
Poor horiz. linearity or foldover - V12, V13, V14
Narrow picture - V12, V13, V14, V15, V16
Vert. off freq. - V7, V10
Horiz. off freq. - V10, V12

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from the chassis. Do not remove the horizontal oscillator to eliminate the high voltage shock hazard.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and replace with a 6J6 which has pin 1 removed.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over dummy converter tube. Low side to chassis.	47.25MC (Unmod)	Any	DC probe to point (A). Common to chassis.	A21	Adjust for MINIMUM deflection.
2.	"	"	41.25MC	"	"	A2	"
3.	"	"	42.7MC	"	"	A3, A4	Attenuate generator output to maintain not more than 1.5 volts at VTVM. Adjust for maximum deflection.
4.	"	"	44.6MC	"	"	A5	"
5.	"	"	42.3MC	"	"	A6	"
6.	"	"	45.25MC	"	"	A7	"

OVERALL VIDEO IF RESPONSE CHECK

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Direct	High side to ungrounded tube shield floating over dummy converter tube. Low side to chassis.	43.5MC (10MC Swp)	41.25MC 42.35MC 45.75MC 47.25MC	Any	Vert. Amp. to point (A). Low side to chassis.		Check for response similar to Fig. 1. Adjust A3 thru A7 for desired response. A7 adjusts tilt, A3 and A4 adjusts band width, A6 places 42.35MC marker, and A5 places 45.75MC marker. A1 and A2 traps should not require retouching.

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
8.	.01MFD	High side to pin 2 (grid) of 12BY7 (V6). Low side to chassis.	4.5MC (Unmod)	Any	DC probe thru detector (Fig. 2) to pin 11 (cathode) of picture tube. Common to chassis.	A8	Adjust for MINIMUM deflection.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from point (B) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
9.	.01MFD	High side to pin 2 (grid) of 12BY7 (V6). Low side to chassis.	4.5MC (Unmod)	Any	DC probe to point (B). Common to chassis.	A9, A10	Adjust for maximum deflection.
10.	"	"	"	"	DC probe to point (C). Common to point (D).	A11	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
9.	.01MFD	High side to pin 2 (grid) of 12BY7 (V6). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any	Vert. Amp. to point (B). Low side to chassis.	A9, A10	Disconnect stabilizing capacitor C3. Adjust for curve of maximum amplitude and symmetry similar to Fig. 3.
10.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A11	Reconnect stabilizing capacitor C3. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 4. SLIGHTLY retouch A10 for maximum amplitude and straightness of crossover lines.

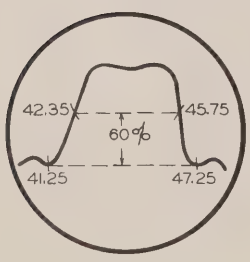


FIG. 1

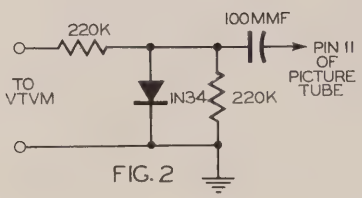


FIG. 2

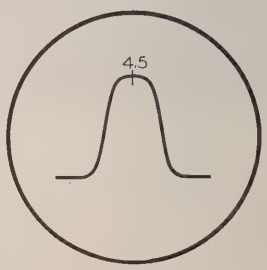


FIG. 3

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ALIGNMENT INSTRUCTIONS (cont)

OSCILLATOR ALIGNMENT

Remove the dummy converter tube and replace the original 6J6 in its socket.
The channel oscillator adjustments are reached thru a hole just to the right of the channel switch shaft.
The correct adjustment screw is accessible thru this hole as the channel switch is turned to each channel.
Use only enough sweep generator output to provide usable pattern on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Set the fine tuning control to the mid-position of its range.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
11.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. to point (A). Low side to chassis.	A12	Video marker should be at 60% on response curve. Place sound marker as shown in Fig. 5.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A13	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A14	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A15	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A16	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A17	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A18	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A19	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A20	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A21	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A22	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A23	

RF AND MIXER ALIGNMENT

Use only enough sweep generator output to provide usable pattern on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
12.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	207MC (10MC Swp)	205.25MC 209.75MC	12	Vert. Amp. to point (E). Low side to chassis.	A24, A25, A26	Adjust for response similar to Fig. 6 with markers above 90%.
13.	"	"	213MC (10MC Swp)	211.25MC 215.75MC	13	"		Check for response curve similar to Fig. 6. If markers fall below 70% on any channel, make slight compromise adjustments of A24, A25 and A26 with channel switch set to that channel. Recheck all other channels to see that they have not been seriously affected.
			201MC (10MC Swp)	199.25MC 203.75MC	11			
			195MC (10MC Swp)	193.25MC 197.75MC	10			
			189MC (10MC Swp)	187.25MC 191.75MC	9			
			183MC (10MC Swp)	181.25MC 185.75MC	8			
			177MC (10MC Swp)	175.25MC 179.75MC	7			
			85MC (10MC Swp)	83.25MC 87.75MC	6			
			79MC (10MC Swp)	77.25MC 81.75MC	5			
			69MC (10MC Swp)	67.25MC 71.75MC	4			
			63MC (10MC Swp)	61.25MC 65.75MC	3			
			57MC (10MC Swp)	55.25MC 59.75MC	2			

IF TRAP ALIGNMENT

The IF trap is for the purpose of reducing interference on Channel 2 from transmitters operating in the 40MC band. If such interference is noted on Channel 2, adjust A27 for minimum interference. If no interference is noted, adjust A27 to maximum clockwise position.

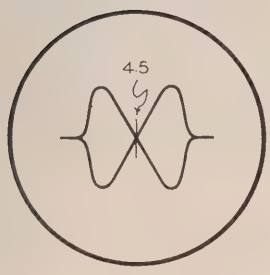


FIG. 4

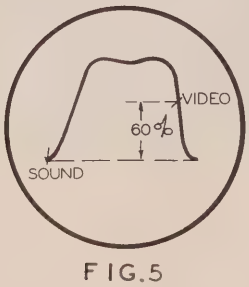


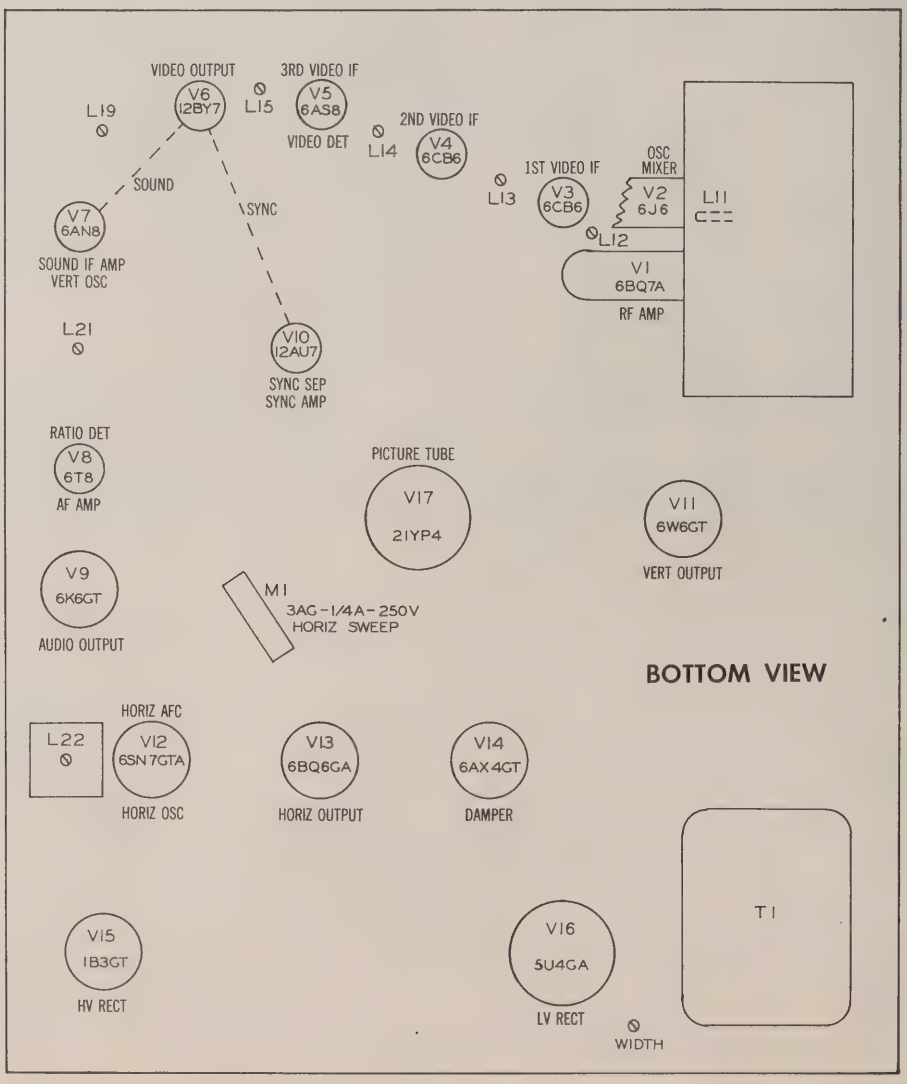
FIG. 5

FIG. 6

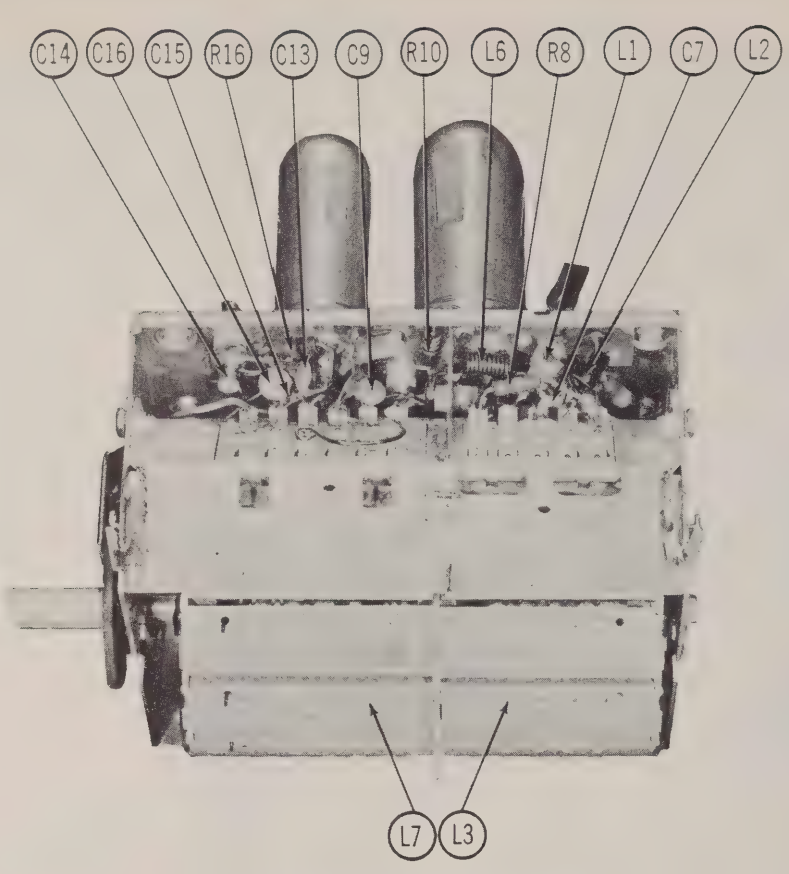
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BQ7A	INF	1Meg	0Ω	.1Ω	0Ω	†500Ω	140KΩ	INF	0Ω
V 2	6J6	†6.8KΩ	†17KΩ	.1Ω	0Ω	235KΩ	10KΩ	0Ω		
V 3	6CB6	1Meg	47Ω	0Ω	.1Ω	†2.3KΩ	†2.3KΩ	0Ω		
V 4	6CB6	1Meg	47Ω	0Ω	.1Ω	†2.3KΩ	†2.3KΩ	0Ω		
V 5	6AS8	†2.3KΩ	.1Ω	180Ω	.1Ω	0Ω	5.6KΩ	0Ω	.1Ω	†2.3KΩ
V 6	12BY7	200Ω	470KΩ	200Ω	0Ω	0Ω	.1Ω	†5.4KΩ	†1.8KΩ	200Ω
V 7	6AN8	▲2.2Meg	2Meg	0Ω	.1Ω	0Ω	†12KΩ	†12KΩ	100KΩ	0Ω
V 8	6T8	INF	27KΩ	INF	.1Ω	0Ω	0Ω	0Ω	10Meg	†500KΩ
V 9	6K6GT	NC	0Ω	†1.2KΩ	†900Ω	500KΩ	NC	.1Ω	560Ω	
V 10	12AU7	†2.2Meg	2.2Meg	0Ω	0Ω	0Ω	†18KΩ	400KΩ	0Ω	.1Ω
V 11	6W6GT	TP	0Ω	†1.2KΩ	†1.3KΩ	1Meg	NC	.1Ω	1.1KΩ	
V 12	6SN7GTA	1.5Meg	†25KΩ	400KΩ	500KΩ	†47KΩ	0Ω	.1Ω	0Ω	
V 13	6BQ6GTA	TP	0Ω	NC	†11KΩ	470KΩ	TP	.1Ω	0Ω	TOP CAP ▲33Ω
V 14	6AX4GT	NC	NC	INF	NC	†15Ω	NC	0Ω	.1Ω	
V 15	1B3GT		PINS	1 - 8	HAVE	INF	RESISTANCE			TOP CAP ▲795Ω
V 16	5U4GA	NC	20KΩ	NC	19Ω	NC	18.5Ω	NC	20KΩ	
V 17	21YP4	0Ω	†130KΩ	PIN 6 †15Ω	PIN 10 47KΩ	PIN 11 †180KΩ	PIN 12 .1Ω			

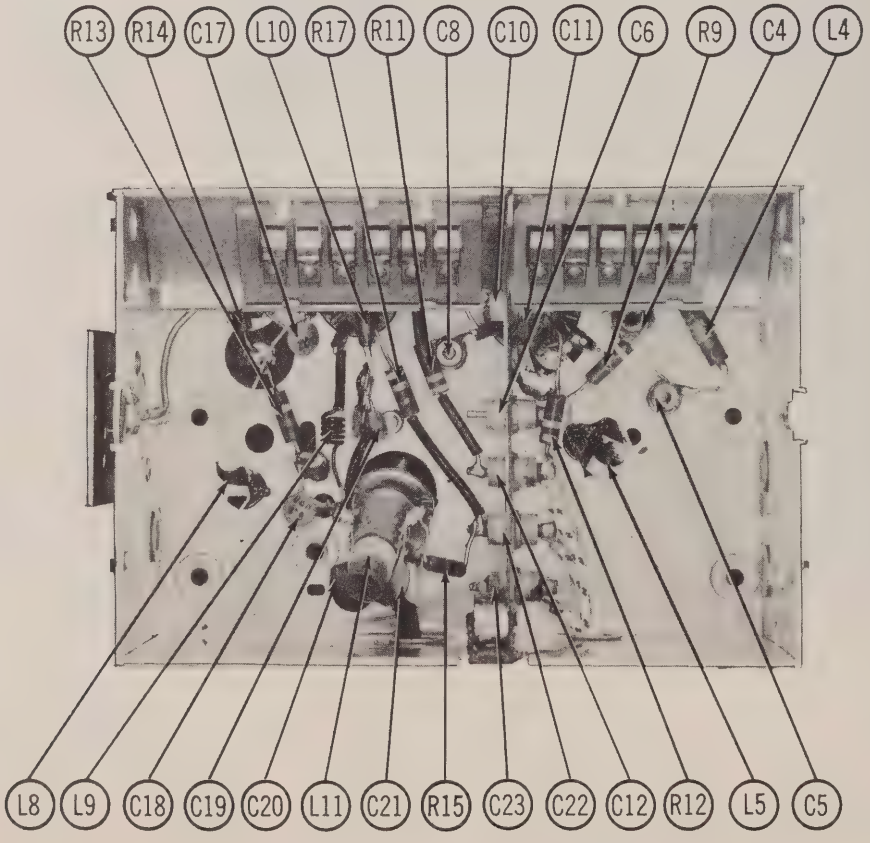
† MEASURED FROM PIN 8 OF V16.
▲ MEASURED FROM PIN 3 OF V14.
TP - TIE POINT
NC - NO CONNECTION



TUBE PLACEMENT CHART

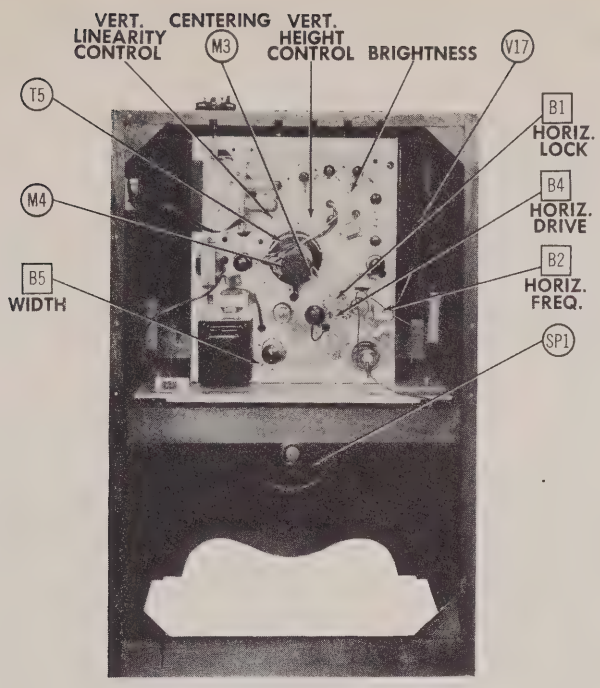


RF TUNER-RIGHT SIDE



RF TUNER-BOTTOM VIEW

PROPERTY OF
F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station, preferably a test pattern.

Set the horizontal hold control to the center of its range.

Adjust the horizontal lock trimmer (B1) until picture synchronizes horizontally.

If unable to obtain proper horizontal sync by adjusting B1, continue with alignment of the horizontal oscillator coil (L22) as follows:

1. Set the horizontal frequency slug (B2) and the waveform slug (B3) at their maximum counter clockwise position.
2. Short together terminals "C" and "D" of the horizontal oscillator coil (L22).
3. Set the horizontal hold control to the center of its range.
4. Adjust B2 clockwise until picture just locks in horizontally.
5. Remove short from terminals "C" and "D" of L22. If picture loses sync with short removed, adjust B3 clockwise until picture falls into sync.
6. Connect the vertical input lead of an oscilloscope thru 100KΩ to terminal "C" of L22. Adjust the waveform slug (B3) clockwise until the broad and narrow peaks are of equal amplitude as shown in Fig. 7. While adjusting B3 keep the picture in sync by tuning the horizontal hold control. Disconnect scope from receiver.
7. Set the horizontal hold control fully clockwise and adjust the horizontal lock trimmer (B1) until the picture starts to fall out of horizontal sync.
8. The horizontal holding action should be as follows:
   a. With horizontal hold fully counter clockwise the picture may lose sync when switching off channel and back again.
   b. With the horizontal hold fully clockwise switch off channel and back. The picture should be out of sync or just pulling out of sync.
   c. With horizontal hold control at mid-position the picture should fall in sync when switching off channel and back again.

Adjust the horizontal drive trimmer (B4) counter clockwise until a white vertical ine appears on the left side of the screen. Then adjust B4 clockwise until the white vertical line disappears.

Adjust the horizontal width coil (B5) for a picture slightly wider than necessary to fill the picture mask horizontally.

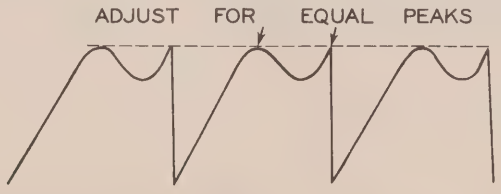


FIG. 7

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V13, V14 and V16. Check adjustments B4 and B5. Check C65, R81, R82, T3, T5A and other associated components.

DRIVE LINES

Check by substitution V13 and V14. Check adjustment B4. Check C65, R81, R82 and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V13 and V14. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines ".

PIE CRUST EFFECT

Check by substitution V12, V13 and V14. Check C58, C59 for open. Check L22, R72, R74 and other associated components.

XMAS TREE EFFECT

Check by substitution V12, V13 and V14. Check T3 and T5 for internal arcing. Check L22, C56, C62, C57, R75, R78 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V7 and V11. Check waveform W7.

If Satisfactory	If Unsatisfactory
Check T4, T5B, C1C, C2D, R65, R63 and other associated components.	Check T2, R59, R60, R6, C51, C55 and other associated components.

INSUFFICIENT SWEEP

Check by substitution V7 and V11. Check height and vertical linearity controls for proper operation. Check R60, T4 and other associated components.

COMPRESSED AT BOTTOM

Check by substitution V7 and V11. Check R60, R6, T2, C55 and other associated components.

COMPRESSED AT TOP

Check by substitution V7 and V11. Check C2D, R7, R63, T4 and other associated components.

FOLDS

Check by substitution V7 and V11. Check C52, C53, C55, R61, T4, T5B and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Substitute V10. Check C48, C49, R51, R53, R55 and other associated components.

LOSS OF VERTICAL SYNC - HORIZONTAL SYNC SATISFACTORY

Substitute V7. Check vertical integrator network. Check T2, R59, R4, C51, and other associated components.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Substitute V12. Check C56, C58, C62, C63, R75, R72 and other associated components.

HORIZONTAL BENDING

Check by substitution V10 and V12. Check components associated with V12.

VIDEO

LOSS OF VIDEO

Substitute V6. Check C37, C39, R32, R34, R35 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A8. Check video IF alignment.

POOR CONTRAST

Substitute V6. Check L16, L18, L20, C37, C39, R36 and other associated components.

NEGATIVE PICTURE

Substitute V6. Check picture tube. Check C37, C39, R36 and other associated components.

SMEAR

Substitute V6 . Check L16, L17, L18, L20, C37, C39, R36 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V1, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V7, V8 and V9. Check stages V8 and V9 using audio signal generator. Apply audio signal across R1.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C44, C45, C46, C47, C2B, R46, R47, R48, T7, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A11 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or No Sound".

POWER

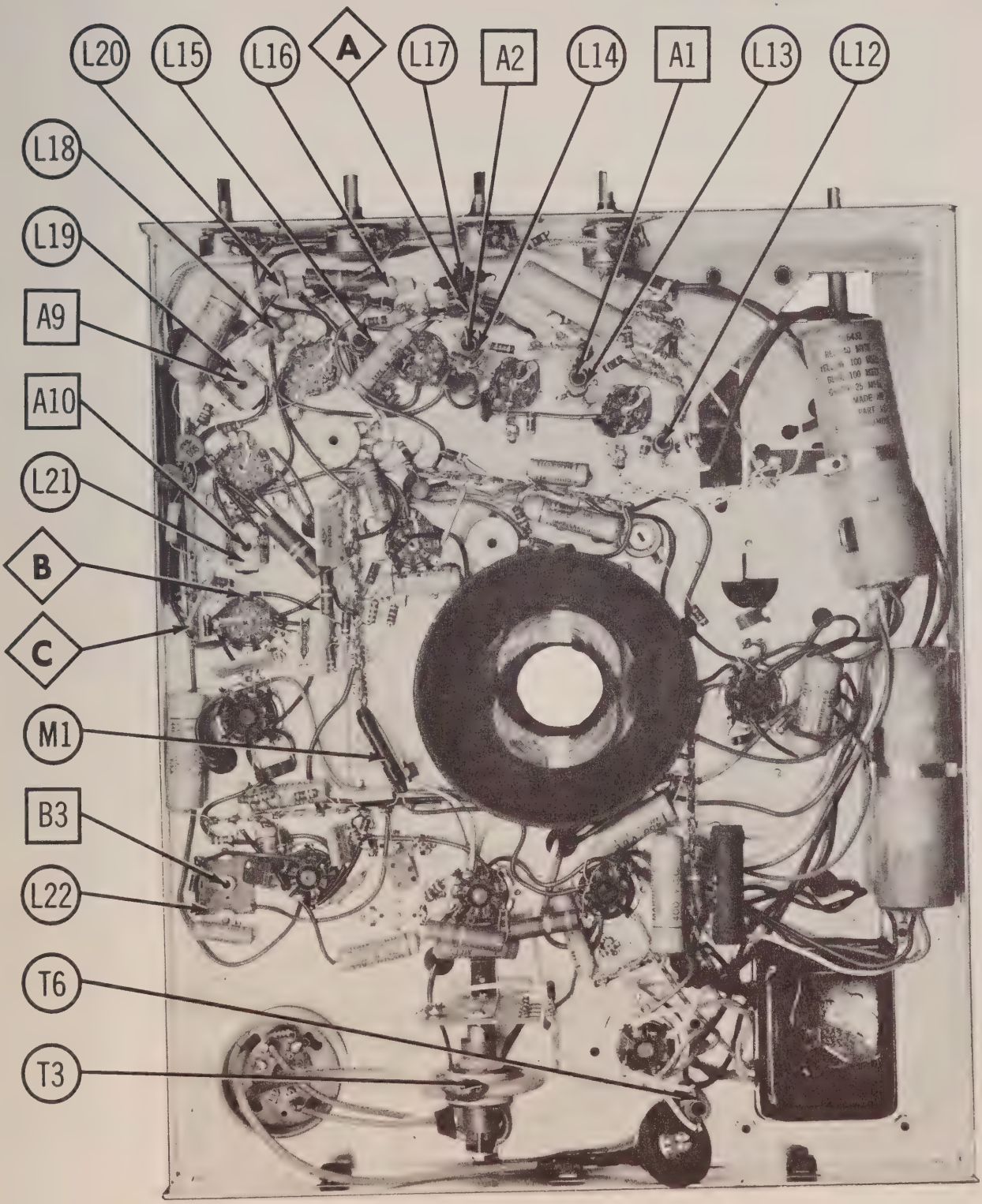
DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, substitute V16. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Substitute V16. Check B+ filter and decoupling network.

PROPERTY OF
F. BLANKENSHIP
3924 MEADE ST.
COLORADO



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

SET 286 FOLDER 9

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No	USE	REPLACEMENT DATA: Philharmonic PART No.	STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amp.	6BQ7A	6BQ7A	9AJ	
V2	Osc.-Mixer	6J8	6J8	T9P	
V3	1st. Video IF Amp.	6CB6	6CB6	TCM	
V4	2nd. Video IF Amp.	6CB6	6CB6	TCM	
V5	3rd. Video IF Amp.- Video Det.	6AS8	6AS8	9DS	
V6	Video Output	1LE3T	1LE3T	9BF	
V7	Sound IF Amp.- Vert. Osc.	6AN8	6AN8	9DA	
V8	Ratio Det.- Sync Separator- Sync Amp.	6T8	6T8	9E	
V9	Audio Output	6K6GT	6K6GT	7S	
V10	Vert. Output	1LA3T	1LA3T	9A	
V11	Horiz. AFC- Horiz. Osc.	6W7GT	6W7GT	7S	
V12	Horiz. Output	6SN7GTA	6SN7GTA	9BD	
V13	Damper	6BQ6GTA	6BQ6GTA	8AM	
V14	Damper	6AX4GT	6AX4GT	4CG	
V15	HV Rectifier	1B3GT	1B3GT	3C	
V16	LV Rectifier	5U4GA	5U4GA	5T	

CATHODE-RAY TUBE

ITEM No	REPLACEMENT DATA: Philharmonic PART No	CBS-HYTRON PART No	GENERAL ELECTRIC PART No	SYLVANIA PART No	WESTINGHOUSE PART No	RETMA BASE TYPE	NOTES
VIT	21YP4	21YP4 21YP4A ①	21YP4 21YP4A ①	21YP4 21YP4A ②	21YP4 21YP4A ①	12L 12L	① Aluminized ② Silver screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP	RATING: VOLT	REPLACEMENT DATA: Philharmonic PART No.	CENTRALAB PART No.	ERIE PART No	MALLORY PART No.	PYRAMID PART No	SANGAMO PART No	NOTES
C1A	80	350	18-279			FP378	TM-804020-450		
B	40	350							
C	20	350							
C1A	100	350	18-280						Q-187
B	40	350							MT-0235
C	25	25							
D	100	50							
C2	4	50	18-292			TC30	TD-4-50	MMT-0505	
C4	3-8			828-10					
C5	3-8			828-10					
C6	800								
C7	3			TCZ-3R3	NP0A-3R3	ZT-5533			
C8	.8-3			828-3	3115-01-0R5	CT565A			
C9	220			DD-221	811-221	UC-5322			
C10	800								
C11	1000			DD-102	801-001	DC-521			
C12	800								
C13	47			DD-470	811-470	UC-5447			
C14	.8-3			828-3	3115-01-0R5	CT565A			
C15	10			TCZ-10	NP0E-100	ZT-541			
C16	5								
C17	1000			DD-102	801-001	DC-521			
C18	6.8			TCZ-6R8	NP0A-6R8	ZT-5568			
C19	1500			DD-152	801-0015	DC-5215			
C20	110			TCN-110	N750L-111				
C21	1500			DD-152	801-0015	DC-5215			
C22	800								
C23	800								
C24	1500		18-196	DD-152	801-0015	DC-5215			C-1215
C25	1500		18-196	DD-152	801-0015	DC-5215			C-1215
C26	680		18-231	DD-681	811-681	UC-5368			K-1368
C27	1500		18-196	DD-152	801-0015	DC-5215			C-1215
C28	47			TCZ-47	NP0-330-47G	ZT-5447		IMP4-P23	KR-1447
C29	.3	400	18-186			PT4023			3304022
C30	680		18-231	DD-681	811-681	UC-5368			K-1368
C31	1500		18-196	DD-152	801-0015	DC-5215			C-1215
C32	47			TCZ-47	NP0-330-47G	ZT-5447			KR-1447
C33	680		18-231	DD-681	811-681	UC-5368			K-1368
C34	1500		18-196	DD-152	801-0015	DC-5215			C-1215
C35	1500		18-196	DD-152	801-0015	DC-5215			C-1215
C36	10		18-223						
C37	.06	400	18-189	DF-503		PT415		IMP4-S5	330415
C38	1500		18-196	DD-152	DD-152	DC-5215			C-1215
C39	.3	400	18-186			PT4023		IMP4-P23	3304022
C40	470		18-199	DD-471	811-471	UC-5347			K-1347
C41	5000		18-197	DD-502	811-005	DC-525			C-1250
C42	10		18-223						
C43	390	500	18-231	D6-391	GP2K-391	MC343			K-1339
C44A	470			DD-471	811-471	UC-5247			K-1347
B	1000		†33-101	DD-102	801-001	DC-521			K-1310
C	10000			DD-103	811-01	DC-531			330611
C45	5000		18-197	DD-502	811-005	DC-525	IMP4-D6		C-1250
C46A	10000								
B	2350		† 33-102	‡PC-80	‡1604-01				
C									
C47	5000		18-197	DD-502	811-005	DC-525	IMP4-D6		C-1250
C48A	270			(GP2K-371	UC-5327				K-1327
B	10000		*33-108	*PC-380	811-01	DC-531			330611
C	25				GP1K-250	UC-5435			K-1435
C49	.05	400	18-189	DF-503		PT415	IMP4-S5		330415
C50A	2000					PT2523	IMP4-D3		C-1230
B	5000		‡33-108	‡PC-100	‡1605-01	PT2525	IMP4-D5		C-1250
C	5000					PT2525	IMP4-D5		C-1250
C51	.0047	400	18-230	D6-472	GP2-332-47E	PT2347	IMP4-D47		3306347

PARTS LIST AND DESCRIPTIONS

CAPACITORS (cont)

ITEM No.	RATING: CAP	RATING: VOLT	REPLACEMENT DATA: Philharmonic PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No	SANGAMO PART No	NOTES
C52	.05	600	18-193	DF-503		PT615	IMP6-S5	330615	
C53	.02	600	18-205	DF-203	817-03	PT613	IMP4-S3	330413	
C54	5000		18-197	DD-502	811-005	DC-525	IMP4-D6	C-1250	
C55	.1	600	18-208	DF-104		PT601	IMP6-P1	330601	
C56	82	500	18-304	TCZ-82	NP0-337-820			KR-1482	
C57	68	500	18-305	TCZ-68	NP0-337-680	Z7-5468		KR-1468	
C58	.06	600	18-189	DF-503		PT415	IMP4-S5	330415	
C59	.02	400	18-205	DF-203	817-03	PT413	IMP4-S3	330413	
C60	.5	300	18-184			PT606	IMP2-P5	330306	
C61	.05	600	18-189	DF-503		PT415	IMP4-S5	330415	
C62	270	500	18-225	TCZ-270	NP0-335-271			KR-1327	
C63	.01	400	18-206	D6-103	GP3-333-103	PT41I	IMP4-SI	330411	
C64	820	500	18-306					KR-1382	
C65	1000	500	18-307	D6-102	GP3L-102	MC355	IMP6-DI	K-1210	
C66	.1	400	18-207	DF-104		PT401	IMP4-P1	330401	
C67	.03	600	18-213	DF-303		PT613	IMP6-S3	330613	
C68	.2	400	18-189			PT4023	IMP4-P23	3304022	
C69	.1	400	18-207	DF-104		PT401	IMP4-P1	330401	
C70	68	2000		DD30-680	3KV-680	DC30468			

† Items C46A, C46B, C46C, R46A and R46B are combined in one unit.
‡ Items C46A, C46B, C46C, R46A and R46B are combined in one unit. When replacing items separately C46B and C46C should total 250MMF.
* Items C48A, C48B, C48C, R50A, R50B and R50C are combined in one unit.
◆ Items C50A, C50B, C50C, R58A, R58B and R58C are combined in one unit.

CONTROLS

ITEM No	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: Philharmonic PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	500KΩ	½	25-27	Q13-133	A47-500K-2	B-60-B	U-48	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWZ-12	Not Req.	US-26	Attach to R1A
R2A	500Ω	½	25-38	Q11-103	A47-500-S	B-4	U-2	Contrast
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R2A
R3A	50KΩ	½	25-30	Q11-123	A47-50K-S	B-31	U-25	Horiz. Hold
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R3A
R4A	1Meg	½	25-29	Q11-139	A47-2Meg-S	B-75	U-58	Vert. Hold
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R4A
R5A	50KΩ	½	25-36	Q11-123	A47-50E-S	BX-31	SU-25	Brightness
B	Shaft		Not Req.	HQ	FXS-1/4	Not Req.	Not Req.	Attach to R5A
R6A	2Meg	½	25-25	Q11-139	A47-2Meg-S	BX-75	SU-58	Height
B	Shaft		Not Req.	HQ	FXS-1/4	Not Req.	Not Req.	Attach to R6A
R7	3500Ω	1	25-24		3B-3000			Vert. Linearity - wire-wound

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Philharmonic PART No.	IRC PART No.	NOTES
R8	15KΩ	½		BTS-15K	
R9	47KΩ	½		BTS-47K	
R10	330KΩ	½		BTS-330K	
R11	470Ω	½		BTS-470	
R12	220KΩ	½		BTS-220K	
R13	220KΩ	½		BTS-220K	
R14	15KΩ	½		BTS-15K	
R15	15KΩ	½		BTS-15K	
R16	10KΩ	½		BTS-10K	
R17	4700Ω	½		BTS-4700	
R18	470Ω	½	60-697	BTS-470	
R19	10KΩ	½	60-780	BTS-10K	
R20	1000Ω	½	60-873	BTS-1000	
R21	47Ω	½	60-696	BTS-47	
R22	470Ω	½	60-697	BTS-470	
R23	1MEG	½	60-811	BTS-1MEG	
R24	47Ω	½	60-696	BTS-47	
R25	470Ω	½	60-697	BTS-470	
R26	5600Ω	½	60-874	BTS-5600	
R27	680Ω	½	60-698	BTS-680	
R28	470Ω	½	60-697	BTS-470	
R29	1Meg	½	60-578	BTS-1Meg	
R30	5600Ω	½	60-874	BTS-5600	
R31	470KΩ	½	60-681	BTS-470K	
R32	47Ω	½	60-696	BTS-47	
R33	680Ω	½	60-698	BTS-680	
R34	2700Ω	2	60-815	BTS-2700	
R35	2700Ω	2	60-815	BTS-2700	
R36	330KΩ	½	60-699	BTS-330K	
R37	330KΩ	½	60-699	BTS-330K	
R38	100KΩ	½	60-901	BTS-100K	
R39	100KΩ	½	60-901	BTS-100K	
R40	100KΩ	½	60-901	BTS-100K	
R41	22KΩ	½	60-744	BTS-22K	
R42	10KΩ	½	60-781	BTS-10Meg	
R43A	50KΩ	½	‡ 33-102	BTS-470K	Note 1
B	500KΩ	½		BTS-470K	
R47	560Ω	1	60-669	BTA-560	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: Philharmonic PART No.	IRC PART No.	NOTES
R48	820Ω	1	60-704	BTA-820	
R49	10KΩ	2	60-780	BTS-10K	
R50A	10KΩ	½		BTS-10K	
B	330K	½	*33-103	BTS-330K	
C	2.2Meg	½		BTS-2.2Meg	
R51	2.2Meg	½	60-688	BTS-2.2Meg	
R52	1Meg	½	60-579	BTS-1Meg	
R53	470KΩ	½	60-681	BTS-470K	
R54	22KΩ	½	60-744	BTS-22K	
R55	22KΩ	1	60-743	BTA-22K	
R56	33KΩ	½	60-695	BTS-33K	
R57	12KΩ	½	60-811	BTS-12K	
R58A	22KΩ	½		BTS-22K	
B	8200Ω	½	◆33-100	BTS-8200	
C	8200Ω	½		BTS-8200	
R59	1Meg	½	60-579	BTS-1Meg	
R60	820KΩ	½	60-706	BTS-820K	
R61	10KΩ	½	60-780	BTS-10K	
R62	1Meg	½	60-579	BTS-1Meg	
R63	470Ω	½	60-697	BTS-470	
R64	100Ω	½	60-752	BTS-100	
R65	1000Ω	½	60-705	BTA-1000	
R66	560Ω	½		BTS-560	
R67	560Ω	½		BTS-560	
R68	330KΩ	½	60-699	BTS-330K	
R69	82KΩ 5%	½	60-703	BTS-82K 5%	
R70	820K	½	60-706	BTS-820K	
R71	330KΩ 5%	½	60-707	BTS-330K 5%	
R72	4700Ω	½	60-759	BTS-4700	
R73	150KΩ	½	60-701	BTS-150K	
R74	68KΩ	½	60-809	BTS-68K	
R75	22KΩ	½	60-744	BTS-22K	
R76	150KΩ 5%	½	60-702	BTS-150K 5%	
R77	8200Ω	½	60-778	BTS-8200	
R78	47KΩ	½	60-680	BTS-47K	
R79	470KΩ	½	60-681	BTS-470K	
R80	47Ω	½	60-696	BTS-47	
R81	2700Ω	2		BTS-2700	Note 2
R82	8200Ω	2	60-706	BTS-8200	
R83	10KΩ	½	60-780	BTS-10K	
R84	3.3Ω	½	60-891		
R85	47KΩ	½	60-680	BTS-47K	
R86	1750Ω	10	60-856	2D-1750	

† Items R43A, R43B, C44A, C44B and C44C are combined in one unit.
‡ Items R46A, R46B, C48A, C48B and C48C are combined in one unit.
* Items R50A, R50B, R50C, C48A, C48B and C48C are combined in one unit.
◆ Items R58A, R58B, R58C, C58A, C58B, C58C are combined in one unit.
Note 1. Some versions use a 250KΩ resistor in this application.
Note 2. Not used in some versions.

TRANSFORMER (POWER)

ITEM No	RATING: PRI.	RATING: SEC. 1	RATING: SEC. 2	REPLACEMENT DATA: Philharmonic PART No	Halldorson PART No	Merit PART No	RCA TYPE No	Stancor PART No	Thordarson PART No	Triad PART No
T1	117VAC ⑥ 1.44A	495VCT ⑤ .250ADC	5VAC ⑤ 3A	80-269		P-3076 ① ④		P-8332 ① ③	26R33 ④	
	SEC. 3	SEC. 4	SEC 5							
	6.3VAC ⑥ 9.7A									

① Enlarge cut-out. Drill new mounting holes.
② Tape 7.3V ⑥ .9A winding. Parallel and phase 6.3V ⑥ 7.1A and 1.2A windings for Sec. #3.
③ Use high voltage tape on Sec. #1 only. Tape low tape. Parallel and phase 6.3V ⑥ 6.5A windings for Sec. #3.
④ Tape 5V ⑤ 3A winding. Parallel and phase 6.3V ⑥ 5A windings for Sec. #3.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA: Philharmonic PART No	Halldorson PART No	Merit PART No	RCA PART No	Ram TYPE No	Stancor Replacement PART No	Thordarson Replacement PART No	Triad Replacement PART No
T2	Vert. Osc. Trans.	80-258	B6702	A-3003	2097I ①	V405	A-8125	26A03	A-97X
T3	Horiz. Output Trans.	80-270	FB41 * ①	HVO-9 * ①	2307I * ①	X080 ①	A-8255 *	FLY-78 *	D-19 ①④
T4	Vert. Output Trans.	80-269	Z1802	A-3035	2047I ①	V307	A-8144	26S72	A-108X
T5A	Yoke-Horiz.(23MP4)	10-810 ②	DF601 ②	MDF-73	222DI ⑤	Y10F20443	DY-11A ②	Y-10 ①④⑤	Y-19-1①
B	Vert. (57MP4)		②	②	⑥	⑤④	⑤④	⑤	④
T6	Width Coil (2-8.5KΩ)	10-804		MWC-8 ⑤	21IRI	30IR15	WC-8	WC-82	WC-12 ⑤

① Drill new mounting hole(s).
② Includes capacitor C70, resistors R66, and R67.
③ Use original rear cover and centering device.
④ Use original horizontal yoke damping network.
⑤ Enlarge mounting hole.
⑥ Connect to coded blue and green terminals.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
	4	9	9	9	9	6	6	9
	7	8	8	8	Jumper 7 & 8	4	4	Jumper 7 & 8
	6	See Note ⑦	See Note ⑦	See Note ⑦	See Note ⑦	See Note ⑦	See Note ⑦	See Note ⑦
	5	3	3	3	3	2	2	3
	1	1	1	1	1	1	1	1
Connect Width Coil Across ⟶	5 & 1	3 & 1	3 & 1	3 & 1	3 & 1	2 & 1	2 & 1	3 & 1
Special Notes ⟶		⑦	⑦	⑦	⑦	⑦	⑦	⑦

⑦ Connect R83 in series with C70 across terminals #3 and #7 of yoke.

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE: PRI	IMPEDANCE: SEC	REPLACEMENT DATA: Philharmonic PART No	Halldorson PART No	Merit PART No	Stancor PART No	Thordarson PART No	Triad PART No	NOTES
T7	6.6KΩ	3.9Ω	80-271	21II3	A-3031	A-3878	24S52	S-7X	

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: Philharmonic PART No.	QUAM PART No.	NOTES
SP1	7"	PM	3.9Ω	79-390	7A31	

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: Philharmonic PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	IF Trap	0Ω						Wound on 68MMF cap.
L2	IF Trap	0Ω						Wound on 68MMF cap.
L3	Ant. Coils	0Ω	CT 0Ω					
L4	IF Trap	1Ω						
L5	Fil. Choke	0Ω						
L6	Neut. Coil	0Ω						
L7	RF, Mixer Grid & Osc. Coils	0Ω		10-835	17-4522 *	TV-130 *	6219 * 6222	Includes 47.25MC trap
L8	Fil. Choke	0Ω		10-506				Includes 41.25MC trap
L9	RF Coil	0Ω		10-507				
L10	Feedback Coil	1.5Ω		10-508	17-4523	TV-130	6219	
L11	Conv. Plate	0Ω						
L12	1st. Video IF	.1Ω	.1Ω	10-835	17-4522 *	TV-130 *	6219 *	
L13	2nd. Video IF	.1Ω	.1Ω	10-506			6222	
L14	3rd. Video IF	.1Ω	.1Ω	10-507				
L15	4th. Video IF	.1Ω	.1Ω	10-508	17-4523	TV-130	6219	
L16	Series Peaking Coil	4.2Ω		10-513	19-3100 ◆	TV-181 ◆	6177 ◆	102 Microbenries, wound on 10KΩ resistor
L17	Shunt Peaking Coil	0.5Ω		10-514	19-3500		6174	470 Microbenries
L18	Series Peaking Coil	8Ω		10-511	19-3300 ◆		6185 ◆	315 Microbenries, wound on 10KΩ resistor

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	Philharmonic PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L19A B	4.5MC Trap Sound IF	1.9Ω		10-554				
L20	Shunt Peaking Coil	9.5Ω		10-612	19-4400 ▲		4566 ▲	433 Microhenries, wound on 27KΩ resistor
L21	Ratio Det.	5.5Ω	1.8Ω CT	10-553	17-3497	TV-115	6205	Tertiary winding -.6Ω
L22	Horiz. Osc.	19Ω	50Ω	10-609	20-1402 ♦	TV-162 ♦	6183 ♦	Waveform winding -48Ω

* Use one winding only.
■ Parallel with 10KΩ resistor.
▲ Parallel with 27KΩ resistor.
♦ Reverse coil mounting in can.

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∿)	Philharmonic PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L23	.220ADC	15.2Ω	.65 HY	80-302	C5041 ①		C-2328 ①		C-21X

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			Philharmonic PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG P/T	1/4A 250V	43-13		318.250 (3AG-P/T-1/4A)		GJV 1/4	

MISCELLANEOUS

ITEM No.	PART NAME	Philharmonic PART No.	NOTES
M2	Tuner	TV1009	VHF
M3	Centering Device		Part of Yoke Cover (T5)
M4	Ion Trap		
B1	Trimmer Cap.	20-147	Horiz. Lock (10-165MMF)
B4	Trimmer Cap.	20-147	Horiz. Lock (10-165MMF)
	Knob	52-143	Channel Selector
	Knob	52-144	Fine tuning
	Knob	52-149	Contrast
	Knob	52-150	On-off-volume
	Knob	52-151	Vert. Hold
	Knob	52-152	Horiz. Hold
	Safety Glass	40-223	
	Mask	14-134	

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DENVER, COLORADO

TROUBLE SHOOTING AIDS (cont)

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V12, V13, V14 and V15. Check fuse, M1. Check waveform, W12.

If Satisfactory	If Unsatisfactory
Check T3, T5A, T6, C69, C67, C68, C66, R81, R82 and other associated components.	Check L22, R78, R75, R74, R77, C61, C62, C63, C65 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V13, V14 and V16. Check C65, R81, R82, T3, T5A and other associated components. Check adjustments B4 and B5.

BLOOMING

Check by substitution V13, V14, V15 and V16. Check C65, R81, R82 and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or No Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5 and V6. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

KEYSTONE EFFECT

Check T5 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at a time, thru the small hole in the cabinet to the right of the channel selector shaft.

PICTURE TUBE SAFETY GLASS CLEANING

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

See tube placement chart on page 5.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

Adjustment of the horizontal oscillator circuit can be made from the top of the chassis. Remove rear cover and supply power to the set.

Set the horizontal hold control at the center of its range .

Adjust the horizontal lock trimmer (B1) until picture synchronizes horizontally.

If picture fails to lock in sync refer to "Horizontal Sweep Circuit Adjustments" on page 11.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L21) located on top of the chassis.

FUSES

One fuse is used for horizontal and vertical sweep circuit protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly centered.

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL WITH MOUNTING BOARD

1. Remove 6 push on type control knobs from top panel of cabinet.
2. Remove 12 wood screws and 1 metal screw. Remove rear cover.
3. Disconnect speaker leads.
4. Remove 2 wood screws. Remove antenna terminal strip.
5. Remove 4 chassis mounting board bolts. Remove chassis with mounting board.
6. Remove 2 speaker nuts. Remove speaker.

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CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

RCA VICTOR MODELS 5-EM-23, 5-EM-24, 5-EM-25 (Ch. RS-148)

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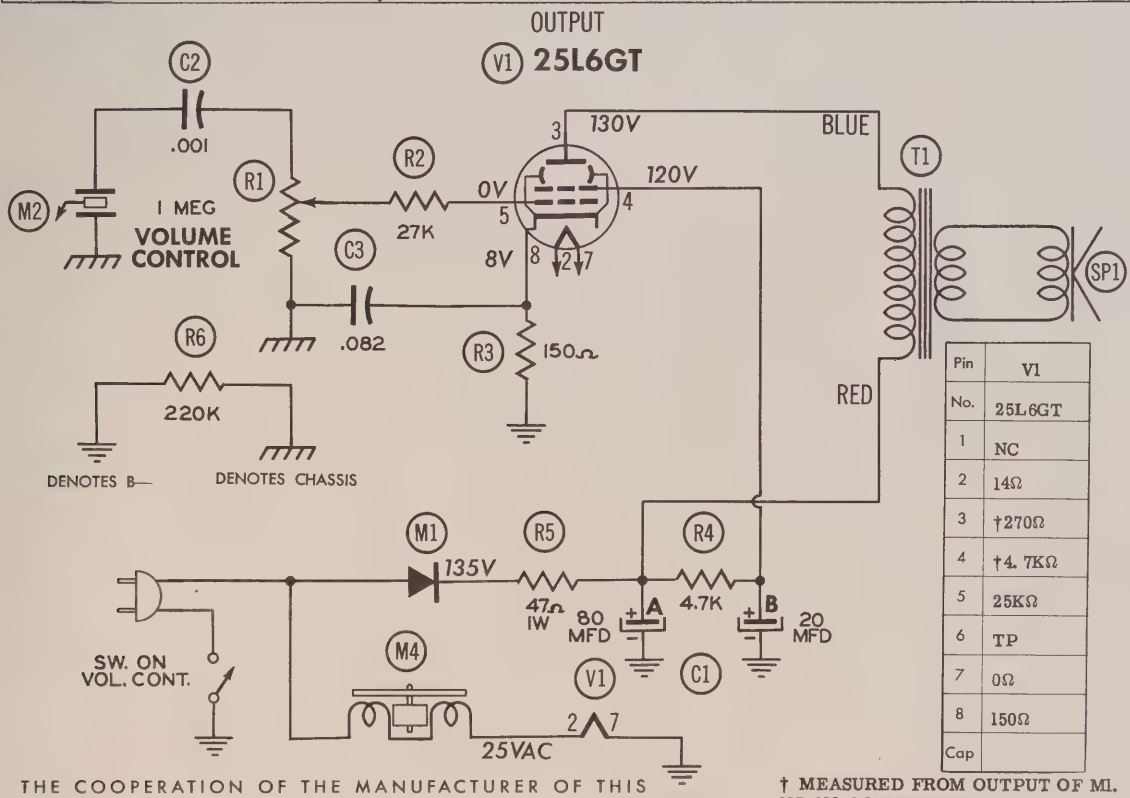
3924 MEADE ST.
DENVER, COLORADO

RCA VICTOR MODELS 5-EM-23, 5-EM-24, 5-EM-25 (Ch. RS-148)

TRADE NAME	RCA Victor Model 5-EM-23 5-EM-24 5-EM-25 (Ch. RS-148)
MANUFACTURER	RCA Victor Radio & "Victrola" Div. Radio Corp. Of America, Camden 2, N. J.
TYPE SET	AC Operated Phono Amplifier With 3 Speed Manual Record Player
TUBES (One)	Type 25L6GT Audio Amplifier
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING . 35 Amp@ 117 Volts AC



Pin No.	V1 25L6GT
1	NC
2	14Ω
3	†270Ω
4	†4. 7KΩ
5	25KΩ
6	TP
7	0Ω
8	150Ω
Cap	

† MEASURED FROM OUTPUT OF M1.
NC-NO CONNECTION.
TP-TIE POINT.

THE COOPERATION OF THE MANUFACTURER OF THIS EQUIPMENT MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: RCA VICTOR PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	AF Amp-Audio Output	25L6GT	25LGT	7S	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: RCA VICTOR PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	80	150	79823			TCT3116	TDL-8030-150	FMT-312	
B	20	150							
C2	.001	600	75249	D6-102	811-102	PT621	IMP6-01	330621	
C3	.082	400	79814					3306182	

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: RCA Victor PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	79827	Q13-137	A47-1Meg-Z	B-70-S	U-53	Volume
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch			76-1	SWE-12	Not Req.	US-27	Attach to R1A

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: RCA Victor PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R2	27KΩ	½	502327	BTS-27K	
R3	150Ω	½	502115	BTS-150	
R4	4700Ω	½	502247	BTS-4700	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: RCA Victor PART No.	REPLACEMENT DATA: IRC PART No.	NOTES
R5	47Ω	1	512047	BTS-220K	
R6	220KΩ	½	502422		

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI.	IMPEDANCE: SEC.	REPLACEMENT DATA: RCA VICTOR PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2.4KΩ	3.5Ω	79826	Z1001	A-2928	24S50	S-1X		

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: RCA VICTOR PART No.	REPLACEMENT DATA: QUAM PART No.	NOTES
SP1	4"	PM	3.5Ω	79696	4A07	

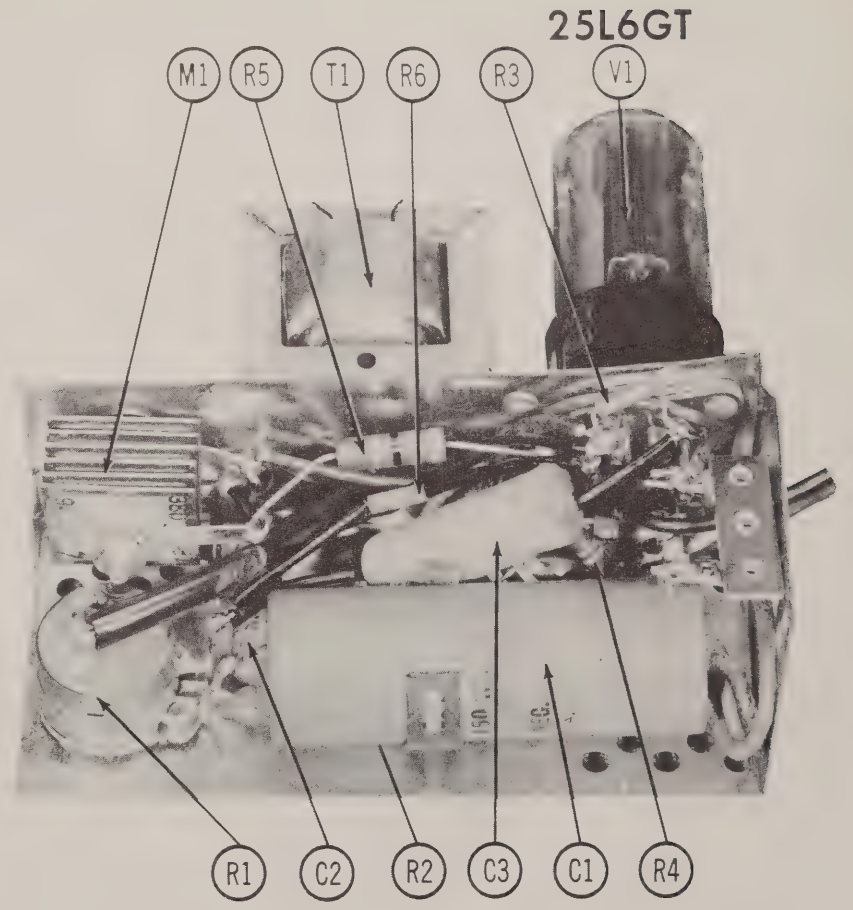
SELENIUM RECTIFIER

ITEM No.	RATING: CURRENT	REPLACEMENT DATA: RCA VICTOR PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	MALLORY PART No.	RADIO RECEPTOR PART No.	SARKES TARZIAN PART No.	NOTES
M1	.050A	77958	1263A	RS65	6S65	8J1	65	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA: RCA VICTOR PART No.	ASTATIC PART No.: CARTRIDGE	ASTATIC PART No.: NEEDLE	ELECTRO-VOICE PART No.: CARTRIDGE	ELECTRO-VOICE PART No.: NEEDLE	REMARKS
M2	79895	L-29 *P-29		60 *2460		*Complete Tone Arm and Cartridge assembly.

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA: RCA VICTOR PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	REMARKS
M3	79898	*J-752 Or *J-152	*B-310 Or †B-388 Or ♦B-388D	*WS-400-2	* Metal † Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	RCA VICTOR PART No.	NOTES
M4	Phono Motor	79828	Complete with speed shifting Parts
	Knob	75945	On-off- volume

PHOTOFACT* Folder

*TRADE MARK

SYLVANIA MODELS 410 Series, 410 "U" Series, 514 Series, 514 "U" Series, 525 Series, 525 "U" Series, 529 Series, 529 "U" Series (Ch. 1-530-1, -2, -3, -4, -5, -6)

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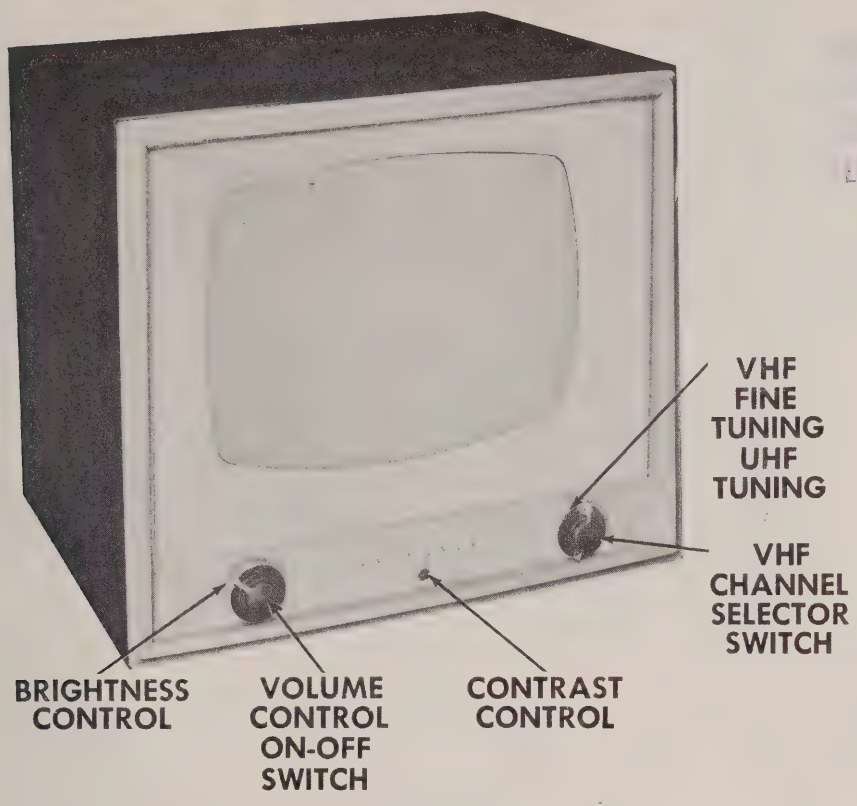

SYLVANIA MODEL 514 "U" Series

TRADE NAME	Sylvania	MODELS	CHASSIS
		410 Series	1-530-1
		410 "U" Series	1-530-2
		525, 529 Series	1-530-3
		525, 529 "U" Series	1-530-4
		514 Series	1-530-5
		514 "U" Series	1-530-6
MANUFACTURER	Sylvania Electric Prod., Inc., Radio & Television Div., 254 Rano St., Buffalo, N.Y.		
TYPE SET	Television Receiver		
TUBES	Twenty-three		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING 1.66 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

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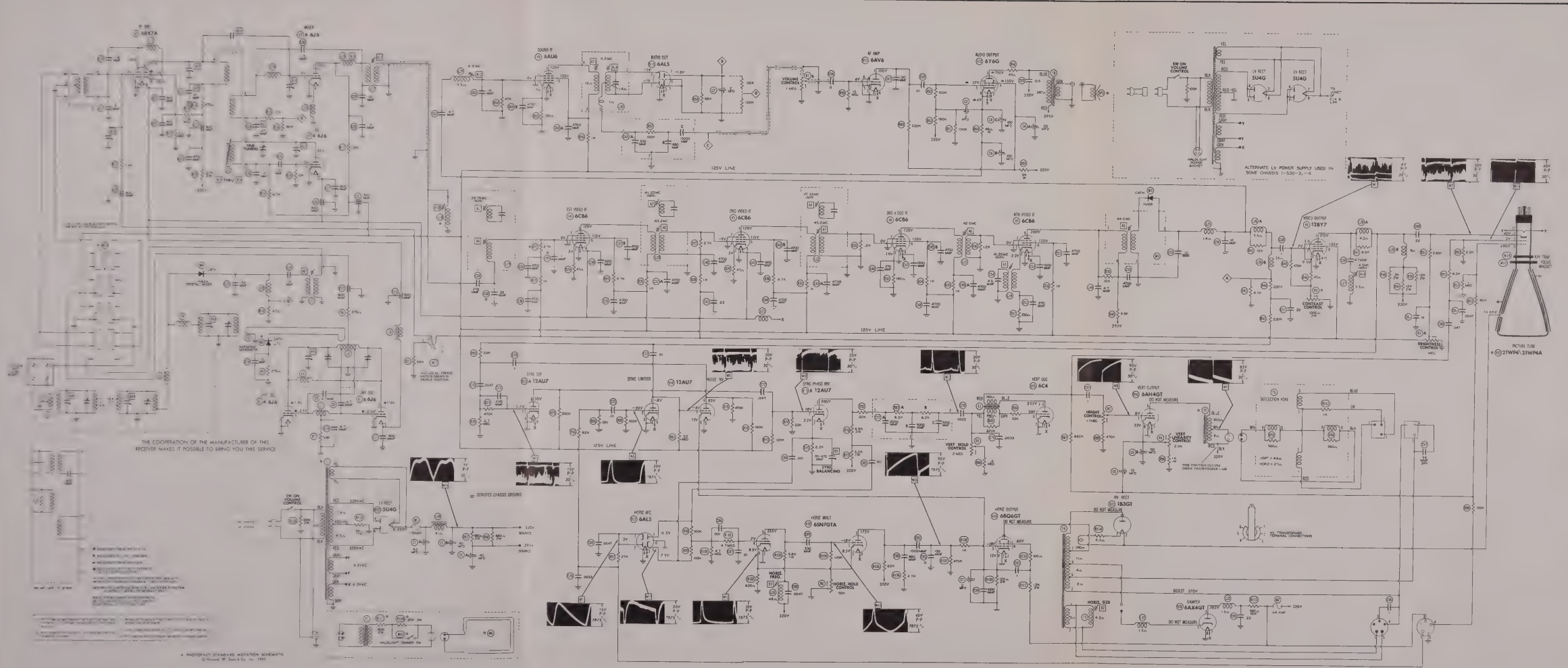
SYLVANIA MODELS 410 Series, 410 "U" Series, 514 Series, 514 "U" Series, 525 Series, 525 "U" Series, 529 Series, 529 "U" Series (Ch. 1-530-1, -2, -3, -4, -5, -6)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ALTERNATE LV POWER SUPPLY USED IN SOME CHASSIS 1-530-3, -4
125V LINE
DENOTES CHASSIS GROUND
A PHOTOFACT STANDARD NOTATION SCHEMATIC

SYLVANIA MODELS 410 Series, 410 "U" Series, 514 Series, 514 "U" Series, 525 Series, 525 "U" Series, 529 Series, 529 "U" Series (Ch. 1-530-1, -2, -3, -4, -5, -6)

SYLVANIA MODELS 410 Series, 410 "U" Series, 514 Series, 514 "U" Series, 525 Series, 525 "U" Series, 529 Series, 529 "U" Series (Ch. 1-530-1, -2, -3, -4, -5, -6)

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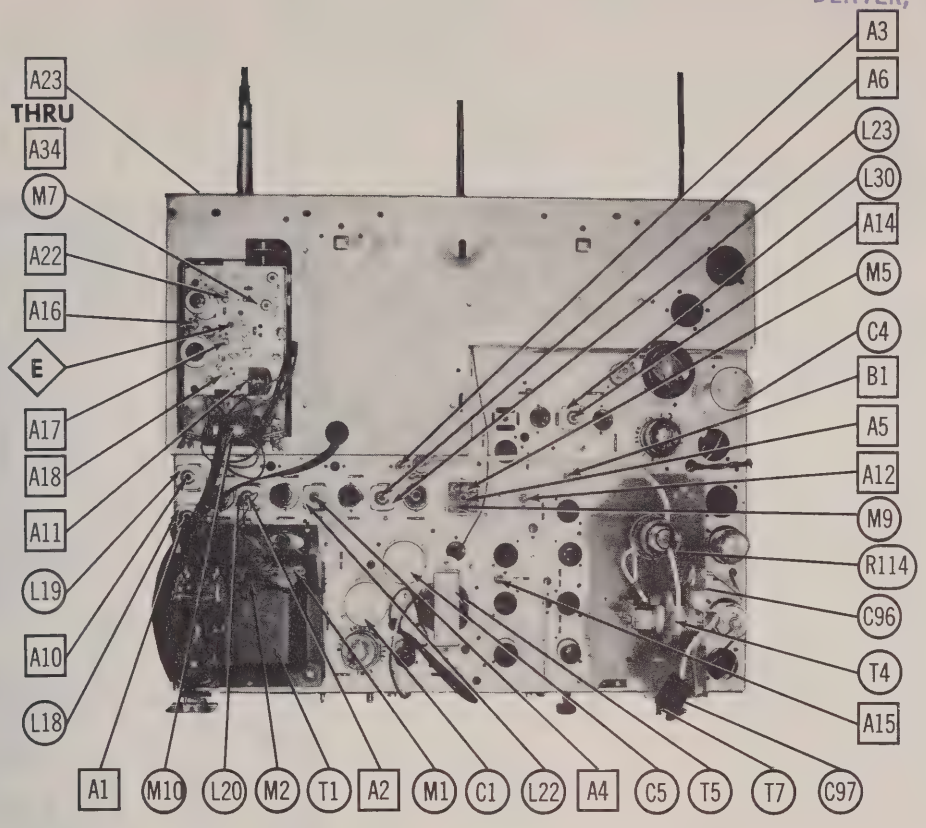
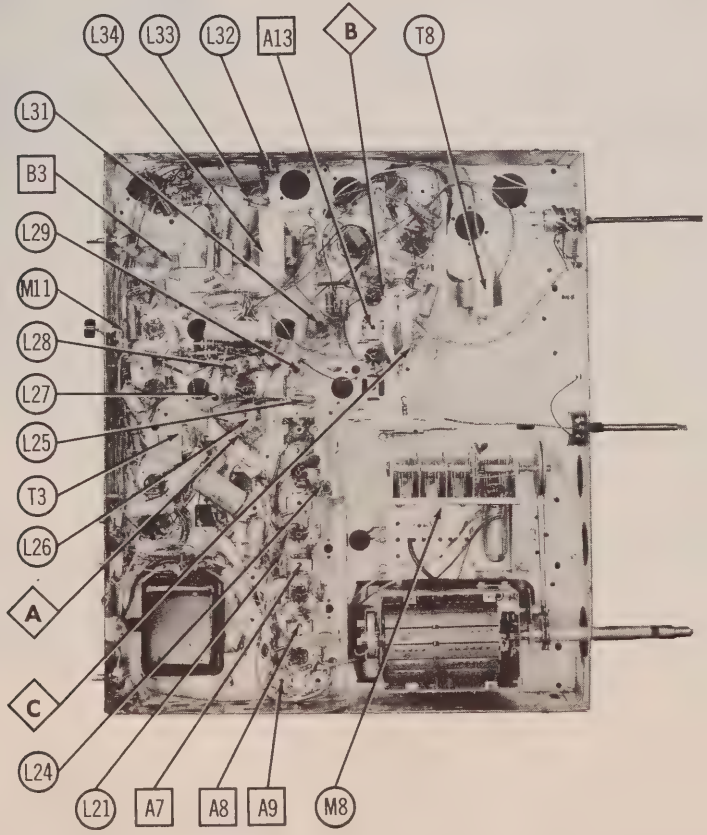
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

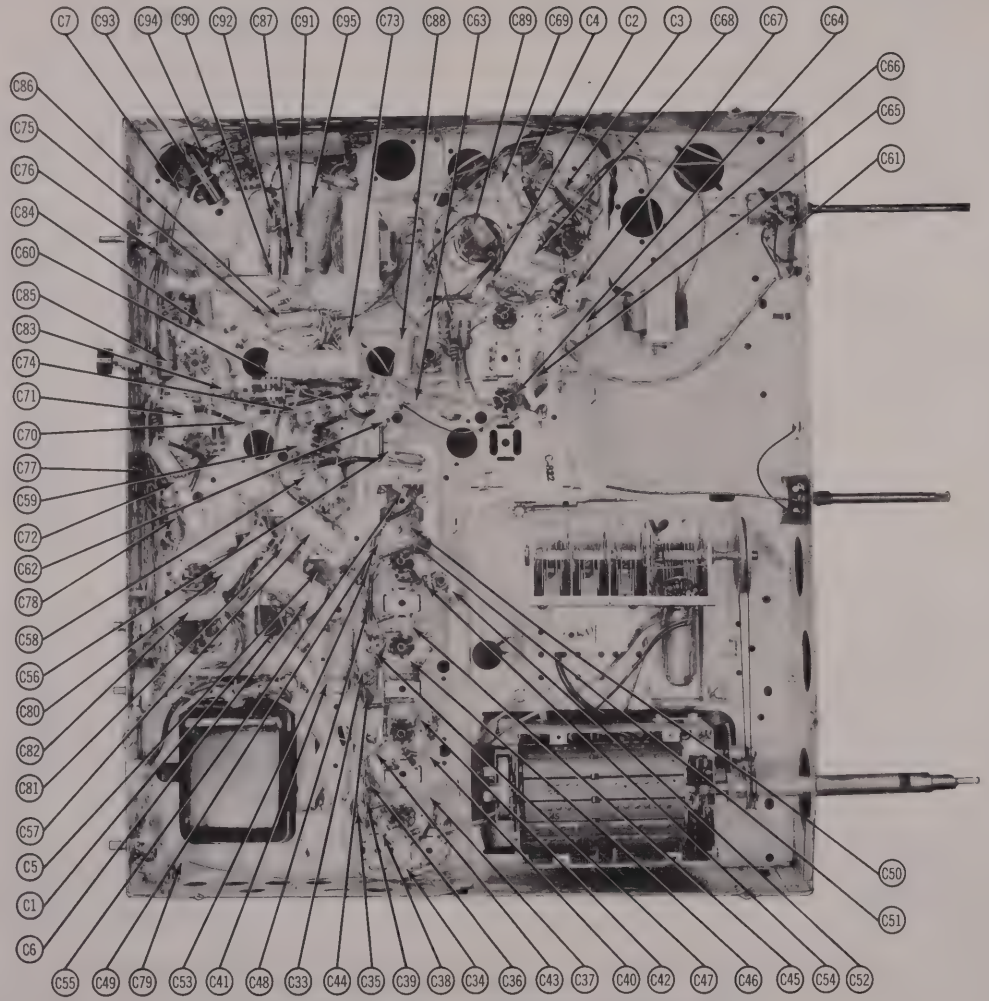


CHASSIS TOP VIEW



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR AND ALIGNMENT IDENTIFICATION

SET 286 FOLDER 11



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

SYLVANIA MODELS 410 Series, 410 "U" Series, 514 Series, 514 "U" Series, 525 Series, 525 "U" Series, 529 Series, 529 "U" Series (Ch. 1-530-1, -2, -3, -4, -5, -6)

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L. F. BLANKENSHIP
39[illegible] MEADE ST.
[illegible], COLORADO

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be taped and kept away from the chassis. Do not remove the horizontal oscillator tube (V18) to disable the high voltage. Be sure VHF tuner shield is in place. Set AGC switch in counter clockwise position.

VIDEO IF ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	High side to an ungrounded tube shield floating over converter tube (V3). Low side to chassis.	Not used	39.75MC (Unmod)	Any unused high band channel	USE VTVM. DC probe to point (A). Common to chassis.	A1	Connect the negative lead of a 3 volt bias supply to the ungrounded side of C41. Connect positive lead to chassis. Adjust for MINIMUM deflection. Increase marker generator for usable reading on VTVM.
2.	"	"	"	41.25MC	"	"	A2, A3	"
3.	"	"	"	47.25MC	"	"	A4	"
4.	"	"	"	44.0MC	"	"	A5	Leave bias as in steps 1, 2 and 3. Attenuate marker generator output to maintain 1 to 2 volts on VTVM. Adjust for maximum deflection.
5.	"	"	"	42.0MC	"	"	A6	"
6.	"	"	"	45.2MC	"	"	A7	"
7.	"	"	"	43.2MC	"	"	A8	Adjust for maximum deflection. Repeat steps 1, 2,3 and 4.
8.	"	High side to pin 5 (grid) of 6J6 (V3). (Wire loop near A16 in tuner). Low side to chassis. Lower converter tube shield to normal position.	43.5MC (10MC Swp)	39.75MC 42.1MC 45.75MC	"	Vert. Amp. thru detector (Fig.1) to pin 5 (plate) of 6CB6 (V4). Low side to chassis.	A9, A10, A11	Remove 3 volt bias . Disconnect primary of L20 from pin 5 of V4 and connect a 330Ω resistor from pin 5 of V4 to B+ end of L20. Alternately adjust A9, A10 and A11 until response curve similar to Fig. 2 is obtained. A9 and A11 places 45.75MC marker, A10 places 42.1MC marker. If necessary, retouch A1 for 39.75MC marker on response curve.
9.	Direct	High side to an ungrounded tube shield floating over converter tube (V3). Low side to chassis.	43.5MC (10MC Swp)	41.25MC 42.1MC 45.0MC 45.75MC 47.25MC	Any unused high band channel	Vert. Amp. thru 33KΩ to point (A). Low side to chassis.	"	Remove 330Ω resistor and restore connection to primary of L20. Reconnect 3 volt bias as in step 1. Use high scope gain and low sweep generator output. Check for response curve similar to Fig.3. If necessary SLIGHTLY retouch A5 thru A-11 to obtain desired response.

SOUND IF ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100KΩ (±1%) resistors in series from point (B) to chassis. The junction of these two resistors is alignment point (D) as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
10.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe to point (B). Common to chassis.	A12, A13	Adjust for MAXIMUM deflection.
11.	"	"	"	"	DC probe to point (C) Common to point (D)	A14	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

SOUND IF ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	.001MFD	High side to point (A). Low side to chassis.	4.5MC (450KC Swp)	4.5MC	Any non-interfering channel	Vert. Amp. to point (B). Low side to to chassis.	A12, A13	Disconnect stabilizing capacitor C2. Adjust for curve of maximum amplitude and symmetry similar to Fig. 4.
11.	"	"	"	"	"	Vert. Amp. to point (C). Low side to chassis.	A14	Reconnect stabilizing capacitor C2. Adjust so that 4.5MC occurs at center of crossover lines as in Fig. 5. SLIGHTLY retouch A13 for maximum amplitude and straightness of crossover lines.

ALTERNATE SOUND IF ALIGNMENT

If a 4.5MC signal of crystal accuracy is not available the sound IF strip may be aligned by tuning in a strong TV station. Connect the VTVM and adjust A12, A13 and A14 as outlined in steps 10 and 11 under "Sound IF Alignment using AM signal generator and VTVM."

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
12.	.001MFD	High side to pin 2 (grid) of 12BY7 (V8). Low side to chassis.	4.5MC (Unmod)	Any	DC probe thru detector (Fig.1) to pin 11 (cathode) of picture tube. Common to chassis.	A15	Short pin 1 (grid) of 6CB6 (V7) to chassis. Adjust A15 for MINIMUM deflection. Remove short from V7.

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ALIGNMENT INSTRUCTIONS (cont)

VHF TUNER ALIGNMENT (Part # 323-0038)

Connect the negative lead of a 3.5 volt bias supply to the tuner AGC terminal.
Disconnect the primary winding of L20 from pin 5 (plate) of 6CB6 (V4) and connect a 330Ω resistor from the B+ end to pin 5 of V4.
During alignment the use of two marker generators are required. Generator #1 (IF) is connected thru a .001 to .005MFD capacitor to pin 2 (cathode) of V4. Marker generator #3 (RF) is connected thru a 3 or 3 MMF capacitor across the sweep generator at the antenna terminals.
If the sweep generator has a built-in marker generator, it should be used for marker generator #2.
Since it is necessary during alignment of the tuner to switch the oscilloscope vertical input between the IF detector (Fig. 6) which is connected to pin 5 of V4, and point Ⓥ thru a 10KΩ resistor it is recommended that a single pole double throw switch be mounted as closely as possible to the oscilloscope vertical input terminals so the vertical input terminals may be easily switched between point Ⓥ and IF detector circuits. All connecting leads should be shielded and kept short as possible.
Remove 6CB6 (V5) from its socket.
The oscillator screws are reached thru a hole to the upper right of the channel switch shaft.
The correct adjustment screws are accessible thru this hole as the channel switch is turned to each channel.
To adjust A19, A30, A31 and A35 the side cover of the tuner must be removed.
Loosen the side cover screws and slide the cover out between chassis and tuner.
Adjustments may then be made thru hole in chassis opposite tuner. Replace cover after completing adjustments.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
13.	Two 120Ω Carbon Resistors Across VHF antenna terminals with 120Ω in each lead. Connect 300Ω resistor across VHF antenna terminals.	69MC (69MC Swp)	67.35MC 71.75MC	4	Vert. Amp. thru 10KΩ to point Ⓥ. Low side to chassis.	A18, A17, A18, A19	Adjust for response similar to Fig. 7. A19 is a wire loop near A16 and affects band width. Video marker should be on inside of response curve.
14.	" "	213MC (10MC Swp)	211.25MC 215.75MC	13	"	A19, A20, A21	If proper band width cannot be obtained by adjustment of A18, it may be necessary to adjust A20 and A21 by positioning the capacitors so as to move,then SLIGHTLY farther apart. Adjust the interstage band width, so that proper overall band width occurs with antenna circuit aligned.
15.	" "	69MC (10MC Swp)	67.25MC 71.75MC	4	"	A18	Adjust for symmetrical response curve. See Fig. 7 for permissable variations.
16.	Direct	High side thru hole in tuner cover to pin 5 (grid) of 6J6 osc. mixer.	43.25MC (10MC Swp)	43.1MC 45.75MC	Set tuner between any two channels	Vert. Amp. thru detector (Fig. 6) to pin 5 of V4. Low side to chassis.	A9, A10, All	Adjust for response similar to Fig. 8. A9 and A-11 effects position of 45.75MC marker, A10 determines band width or position of 43.1MC marker.
17.	Two 120Ω Carbon Resistors	Same as step 13.	69MC (10MC Swp)	67.25MC (RF marker) 45.75MC (IF Video Marker)	4	"	A23, A25	Adjust to make 67.25MC marker coincide with 45.75MC marker on response curve. If necessary, adjust A25 to bring marker within range of A23.
18.	Two 120Ω Carbon Resistors	Same as step 13.	57MC (10MC Swp)	55.25MC 59.75MC	2	Vert. Amp. thru detector (Fig. 6) to pin 5 of V4. Low side to chassis.	A23	Adjust to make video RF marker and 45.75MC IF marker coincide on response curve (See Fig. 8). 43.1MC marker should appear as shown in Fig. 8. Check RF bandpass on each channel for response similar to Fig. 7. If necessary SLIGHTLY retouch A16, A17, A18 and A22 for best compromise on all channels.
		63MC (10MC Swp)	61.25MC 65.75MC	3		A24	
		69MC (10MC Swp)	67.25MC 71.75MC	4		A25	
		79MC (10MC Swp)	77.25MC 81.75MC	5		A26	
		85MC (10MC Swp)	83.25MC 87.75MC	6		A27	
19.	" "	177MC (10MC Swp)	175.25MC 179.75MC	7	"	A28	Same as step 18. If one or more coil stripe cannot be made to track properly without peaking coils to correct pass bands, replace stripe. If a deep valley occurs adjust A36 by compressing or expanding coil turns. If conditions remain uncorrected replace the 6J6 oscillator-mixer tube. If 6J6 is replaced repeat steps 13 thru 17.
		183MC (10MC Swp)	181.25MC 185.75MC	8		A29	
		189MC (10MC Swp)	187.25MC 191.75MC	9		A30	
20.	" "	195MC (10MC Swp)	193.25MC 197.75MC	10	"	A31	Same as step 18.
		201MC (10MC Swp)	199.25MC 203.75MC	11		A32	
		207MC (10MC Swp)	205.25MC 209.75MC	12		A33	
21.	" "	213MC (10MC Swp)	211.25MC 215.75MC	12	"	A34	Same as step 18. Also if valley is too deep on response curve SLIGHTLY readjust A35 by compressing or expanding coil turns. Replace V5 in its socket and remove 330Ω resistor and restore connection of L20 to normal. Remove test equipment and continue alignment (UHF) with step 49.

VHF TUNER ALIGNMENT (Part # 323-0053)

Connect the negative lead of a 3 volt bias supply as under, " Video IF Alignment". Positive lead to chassis. Disconnect the primary winding of L20 from pin 5 (plate of 6CB6 (V4) and connect a 330Ω from B+ end of L30 to pin 5 of V4.
During alignment the use of two marker generators are required. Generator #1 (IF) is connected thru a 2 or 3MMF capacitor to the input of detector probe (See Fig. 9). Marker generator #2 (RF) is connected thru a 2 or 3 MMF capacitor across sweep generator antenna terminals. If sweep generator has a built-in marker generator, it should be used for marker generator #2. Since it is necessary during alignment to switch the oscilloscope vertical input between the IF detector circuit (Fig. 6) which is connected to pin 5 of V4, and the RF detector circuit (Fig. 9), which is connected to alignment point Ⓥ on tuner, it is recommended that a single pole double throw switch be mounted as closely as possible to the oscilloscope vertical input terminals so that the vertical input terminals may be easily switched between RF and IF detector circuits. All connecting leads should be shielded and kept as short as possible.
Remove 6CB6 (V5) from its socket.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

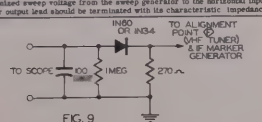


FIG. 9

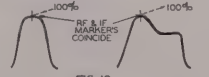


FIG. 10

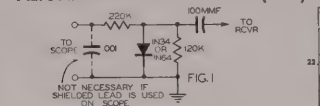


FIG. 1

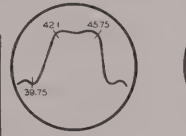


FIG. 2

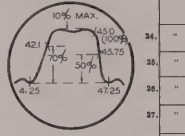


FIG. 3

FIG. 4

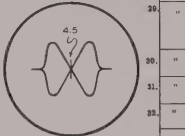


FIG. 5

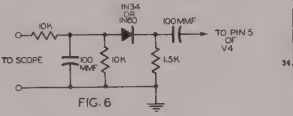


FIG. 6

FIG. 7

FIG. 8

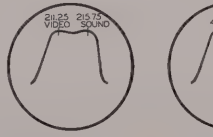


FIG. 11

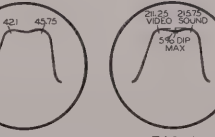


FIG. 12

FIG. 13

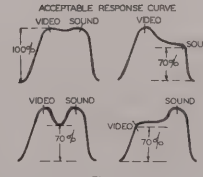


FIG. 14

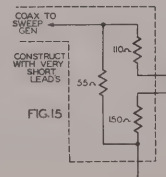


FIG.15

VHF TUNER OSCILLATOR ALIGNMENT (PART #323-0069)

Since channels 2 to 5 and 7 to 12 are aligned by expanding or compressing coil increments, the preceding aligned increments must not be disturbed.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
22.	Two 120Ω Carbon Resistors Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC (RF Marker) 45.75MC (IF Marker)	13	Vert. Amp. thru detector (Fig. 9) to IF marker generator and point Ⓥ. Low side to chassis.	A36	Adjust so that RF and IF markers coincide as in Fig. 10. Curves need not be symmetrical until RF alignment is completed.
23.	" "	207MC (10MC Swp)	205.25MC 45.75MC	12	"	A37	Expand or compress coil until markers coincide as in Fig. 10. Curves may not be symmetrical until RF alignment is completed.
24.	" "	201MC (10MC Swp)	199.25MC 45.75MC	11	"	A38	"
25.	" "	195MC (10MC Swp)	193.25MC 45.75MC	10	"	A39	"
26.	" "	189MC (10MC Swp)	187.25MC 45.75MC	9	"	A40	"
27.	" "	183MC (10MC Swp)	181.25MC 45.75MC	8	"	A41	"
28.	" "	177MC (10MC Swp)	175.25MC 45.75MC	7	"	A43	"
29.	" "	85MC (10MC Swp)	83.25MC 45.75MC	6	Vert. Amp. thru detector (Fig. 9) to IF marker generator. Low side to chassis.	A43	Adjust so RF and IF markers coincide as in Fig 10.
30.	" "	79MC (10MC Swp)	77.25MC 45.75MC	5	"	A44	Compress or expand coil until markers coincide as in Fig. 10.
31.	" "	69MC (10MC Swp)	67.25MC 45.75MC	4	"	A45	"
32.	" "	63MC (10MC Swp)	61.25MC 45.75MC	3	"	A46	"
33.	" "	57MC (10MC Swp)	55.25MC 45.75MC	2	"	A47	"

VHF TUNER RF ALIGNMENT (PART #323-0053)

Use of only one marker generator is needed.
Care must be exercised not to disturb the proceeding aligned coil increments.

DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
34.	Two 120Ω Carbon Resistors Across antenna terminals with 120Ω in each lead.	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru detector (Fig. 9) to IF marker generator point Ⓥ. Low side to chassis.	A48, A49, A50	Adjust A48 for maximum mid-band height regardless of skirts. Adjust A50 for proper skirt contour. Adjust A49 for flat-topped response. (See Fig. 11). Video carrier must be 100%. Sound carrier may be low as 70%.
35.	" "	"	45.75MC 43.1MC	13	Vert. Amp. thru detector (Fig. 6) to pin 5 of V4. Low side to chassis.	A9, All	Adjust for response curve similar to Fig. 13.
36.	" "	"	211.25MC 215.75MC	13	Vert. Amp. thru detector (Fig. 9) to IF marker generator point Ⓥ. Low side to chassis.		If necessary, SLIGHTLY retouch A49 for flat-top. There must not be more than 9% dip in response curve (Fig.13).
37.	" "	207MC (10MC Swp)	205.25MC 209.75MC	12	"	A51, A52, A53	Compress or expand coils for channel 12 to obtain response similar to Fig. 14. A51 adjusts mid-band amplitude, A52 adjusts skirt frequency. A53 adjusts for flat-topped response.

SYLVANIA MODELS 410 "U" Series, 410 "UJ" Series, 314 Series, 314 "U" Series, 323 Series, 523 "U" Series, 529 Series, 529 "U" Series (Ch. 1-330-1, -2, -3, -4, -5, -6)

ALIGNMENT INSTRUCTIONS (cont)

VHF TUNER RF ALIGNMENT (PART #323-0053) CONT.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
38.	Two 120Ω Carbon Resistors	Across antenna terminals with 120Ω in each lead.	201MC (10MC Swp)	199.25MC 203.75MC	11	Vert. Amp. thru detector (Fig. 9) to IF marker generator point (F). Low side to chassis.	A54, A55, A56	Compress or expand coils for curve similar to Fig. 14. Picture and sound markers must remain on top of curve.
39.	"	"	195MC (10MC Swp)	193.25MC 197.75MC	10	"	A57, A58, A59	"
40.	"	"	189MC (10MC Swp)	187.25MC 191.75MC	9	"	A60, A61, A62	"
41.	"	"	183MC (10MC Swp)	181.25MC 185.75MC	8	"	A63, A64, A65	"
42.	"	"	177MC (10MC Swp)	175.25MC 179.75MC	7	"	A66, A67, A68	"
43.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A69, A70, A71	"
44.	"	"	79MC (10MC Swp)	77.25MC 81.75MC	5	"	A72, A73, A74	"
45.	"	"	69MC (10MC Swp)	67.25MC 71.75MC	4	"	A75, A76, A77	"
46.	"	"	63MC (10MC Swp)	61.25MC 65.75MC	3	"	A78, A79, A80	
47.	"	"	57MC (10MC Swp)	55.25MC 59.75MC	2	"	A81, A82, A83	"

48. Recheck all channels for flat-topped response. If necessary, retouch A49 thru 83 in order given. A dip of 30% is permissable for all channels. If the bandwidth of any channel is insufficient after fore going adjustments, adjust "gimmicks" A84, A85 and A86 by bending wire toward or away from capacitors which are located next to each "gimmick". Remove connection to L20. Replace V5 in its socket. Remove test equipment. Continue alignment of UHF with step 49, if necessary.

UHF TUNER ALIGNMENT(PART #323-0019)

Video bandpass should be checked before attempting UHF alignment. Refer to step 8 and Fig. 2. Turn channel selector switch to UHF position. Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection. The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

UHF TUNER OUTPUT CIRCUIT ALIGNMENT

Connect the negative lead of a 2.5 volt bias supply to VHF tuner AGC terminals. Positive lead to chassis.
Disconnect the primary winding of L20 from pin 5 (plate) of 6CB6 (V4) and connect a 330Ω resistor from the B+ end of L20 to pin 5 of V4.
Connect the IF and RF marker generators and scope as outlined under"VHF Tuner Alignment" (part #323-0038).

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
49.	Direct	High side to point (G). Low side to chassis.	43.25MC (10MC Swp)	42.1MC 45.75MC	UHF	Vert. Amp. thru detector (Fig.6) to pin 5 of V4. Low side to chassis.	A87	Adjust for response similar to Fig. 2.

UHF TUNER PRESELECTOR ALIGNMENT

Same instructions as "UHF Tuner Output Circuit Alignment".

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
50.	See Fig. 15	Thru matching pad (Fig.15) to UHF antenna terminals.	473MC thru 887MC (10MC Swp)	42.1MC 45.75MC	14 thru 83	Vert. Amp. thru detector (Fig.6) to pin 5 of V4. Low side to chassis.	A88, A89, A90	Turn tuner and sweep generator simultaneously thru the UHF tuning range and observe response curve which should be similar to Fig. 16. Adjust A88, A89 and A90 for best compromise on dip and tilt. Additional adjustment can be made by SLIGHTLY bending rotor plates. Do not readjust A9, A10 or A11 to remove excessive tilt in overall response curve. Disconnect test equipment. Remove 330Ω resistor from pin 5 of V4 and restore connection to L20. Replace V5 in its socket.

UHF OSCILLATOR ADJUSTMENT

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
51.	See Fig. 15	Thru matching pad (Fig.15) to UHF antenna terminals.	Not used	890MC (Unmod)	83 UHF (Tuning Cap.fully open)	Use VTVM. DC probe to point (A). Common to chassis.	A91	Adjust for maximum deflection.

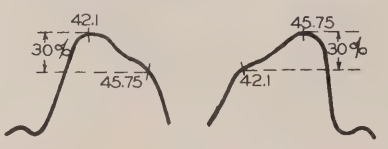
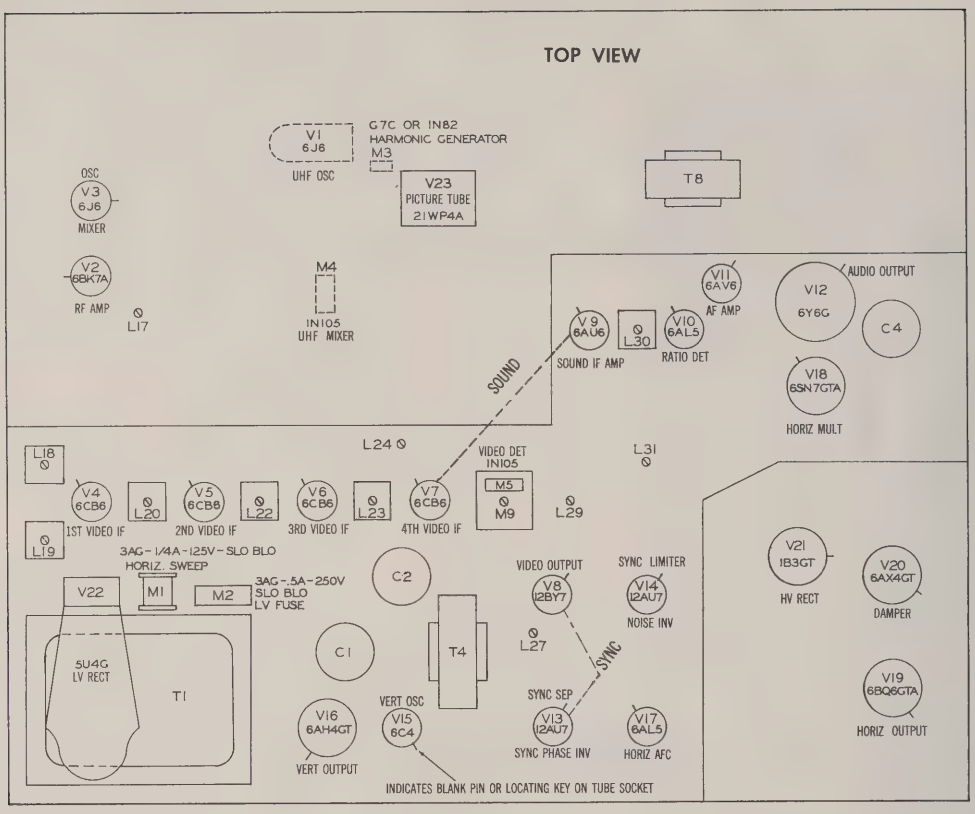


FIG. 16

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - **V22, Fuse (M1)**

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - **V3, V4, V5, V6, V7, V12 (V1 UHF only)**
No pic, no sound, has snow - **V2, V3, V4**
No pic, has sound, has raster - **V8, V23**
Has pic, no sound - **V9, V10, V11, V12**

SYNC FAILURE
No vert. sync - **V13, V15**
No horiz. sync - **V13, V17, V18**
No vert. or horiz. sync - **V13, V14**

SWEEP FAILURE
No raster, has sound - **V18, V19, V20, V21, V23, Fuse (M2)**
No vertical deflection - **V15, V16**
Poor vert. linearity or foldover - **V15, V16**
Poor horiz. linearity or foldover - **V18, V19, V20**
Narrow picture - **V18, V19, V20, V21, V22**
Vert. off freq. - **V13, V15**
Horiz. off freq. - **V13, V17, V18**

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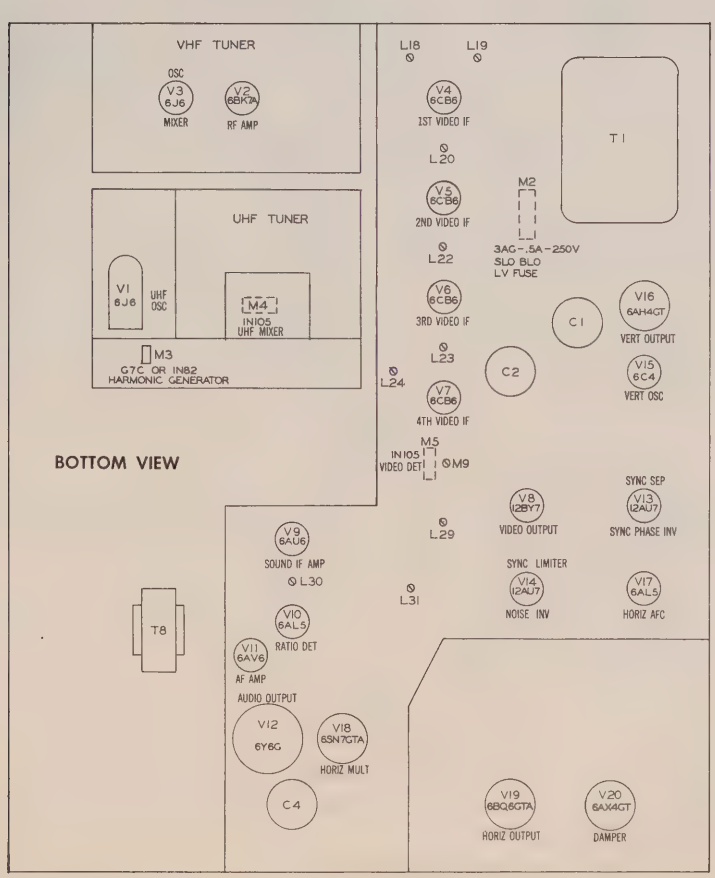
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6J6	*■500Ω	*■500Ω	.1Ω	0Ω	5.6KΩ	5.6KΩ	0Ω		
V 2	6BK7A	INF	500KΩ	0Ω	.1Ω	0Ω	†3.2KΩ	1Meg	INF	0Ω
V 3	6J6	■4.7KΩ	■10KΩ	.1Ω	0Ω	190KΩ	10KΩ	0Ω		
V 4	6CB6	500KΩ	47Ω	0Ω	.1Ω	■1KΩ	■4.7KΩ	0Ω		
V 5	6CB6	500KΩ	47Ω	.1Ω	0Ω	■1KΩ	■4.7KΩ	0Ω		
V 6	6CB6	.1Ω	180Ω	0Ω	.1Ω	■1KΩ	■1KΩ	0Ω		
V 7	6CB6	.1Ω	330Ω	.1Ω	0Ω	†7.1KΩ	■1KΩ	0Ω		
V 8	12BY7	350Ω	470KΩ	350Ω	.1Ω	.1Ω	0Ω	†4KΩ	80KΩ	350Ω
V 9	6AU6	47KΩ	0Ω	.1Ω	0Ω	■1KΩ	■1KΩ	100Ω		
V 10	6AL5	INF	INF	.1Ω	0Ω	0Ω	0Ω	68KΩ		
V 11	6AV6	15Meg	0Ω	0Ω	.1Ω	0Ω	0Ω	†230KΩ		
V 12	6Y6G	TP	80KΩ	†700Ω	†10KΩ	200KΩ	TP	80KΩ	■68Ω	
V 13	12AU7	†10KΩ	22KΩ	2.2KΩ	.1Ω	.1Ω	■330KΩ	3.2Meg	0Ω	0Ω
V 14	12AU7	2.2Meg	100KΩ	0Ω	0Ω	0Ω	■130KΩ	22Meg	120Ω	.1Ω
V 15	6C4	▲780KΩ	NC	0Ω	.1Ω	▲780KΩ	2Meg	0Ω		
V 16	6AH4GT	1.2Meg	0Ω	NC	TP	†950Ω	TP	.1Ω	2KΩ	
V 17	6AL5	27KΩ	27KΩ	.1Ω	0Ω	4.8Meg	0Ω	4.8Meg		
V 18	6SN7GTA	150KΩ	†82KΩ	820Ω	10Meg	†5.6KΩ	820Ω	0Ω	.1Ω	
V 19	6BQ6GT	NC	.1Ω	NC	†12KΩ	470KΩ	TP	0Ω	120Ω	Top Cap ▲12.5Ω
V 20	6AX4GT	TP	NC	320KΩ	TP	†600Ω	TP	.1Ω	0Ω	
V 21	1B3GT		PINS	1 - 8	HAVE	INFINITE	RESISTANCE			Top Cap ▲272Ω
V 22	5U4G	NC	200KΩ	NC	85Ω	NC	85Ω	NC	200KΩ	
V 23	21WP4A	80KΩ	2.2KΩ	Pin 10 ▲280KΩ	Pin 11 ■500KΩ	Pin 12 80KΩ				

▲ MEASURED FROM PIN 3 OF V20.
* MEASURED IN "UHF" POSITION.
■ MEASURED FROM 125V LINE.
† MEASURED FROM PIN 8 OF V22.
TP - TIE POINT
NC - NO CONNECTION



TUBE PLACEMENT CHART

SET 286 FOLDER 11

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V19, V20, and V22. Check C91, C92, C94, R105, R110, R111, T4, T6A, T7 and other associated components.

DRIVE LINES

Check by substitution V19 and V20. Check C91, C92, R111, T4, T6A and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V19 and V20. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V18, V19 and V20. Check C87 for open. Check L31, C88, C86, R101 and other associated components.

XMAS TREE EFFECT

Check by substitution V18, V19 and V20. Check T4 and T6 for internal arcing. Check C85, C88, C89, L31, R103 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V15 and V16. Check waveform W8.

If Satisfactory	If Unsatisfactory
Check T5, T6B, C5B, C6, R90 and other associated components.	Check T3, C78, C79, C82, R88, R87, R85 and other associated components.

INSUFFICIENT SWEEP

Check by substitution V15 and V16. Check height and vertical linearity controls for proper operation. Check R87, T5 and other associated components.

COMPRESSED AT BOTTOM

Check by substitution V15 and V16. Check R88, R87, C82, T3 and other associated components.

COMPRESSED AT TOP

Check by substitution V15 and V16. Check C5B, R90, R4, T5 and other associated components.

FOLDS

Check by substitution V15 and V16. Check C80, C81, C82, C79, T5, T6B and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Check by substitution V13 and V14. Check C70, C72, C73, R76, R72, R77 and other associated components.

LOSS OF VERTICAL SYNC-HORIZONTAL SYNC SATISFACTORY

Substitute V15. Check vertical integrator network. Check C78, C79, T3, R86, R85, R3 and other associated components.

LOSS OF HORIZONTAL SYNC-VERTICAL SYNC SATISFACTORY

Check by substitution V17 and V18. Check C83, C84, C86, C87, C88, L31, R104 and other associated components.

HORIZONTAL BENDING

Check by substitution V13, V14, V17 and V18. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Substitute V8. Check C58, C60, R48, R49, R50, R46, L28 and other associated components.

SOUND BARS(4.5MCBEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A15. Check video IF Alignment.

POOR CONTRAST

Substitute V8. Check L26, C58, C60, R48, R49, R50 and other associated components.

NEGATIVE PICTURE

Substitute V8. Check picture tube. Check C58, C60 and other associated components.

SMEAR

Substitute V8. Check video crystal detector network. Check L26, C58, C60 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V2, V4, V5, V6, V7 and V8 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V9, V10, V11 and V12. Check stages V11 and V12 using audio signal generator. Apply audio signal across R1B.

If Satisfactory	If Unsatisfactory
Check ratio detector and audio IF stages for component failure or change of value.	Check C66, C67, C68, C69, C4A, C4B, R65, R67, R68, R66, T8, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustment A14 for minimum buzz. If still unsatisfactory, check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or no Sound".

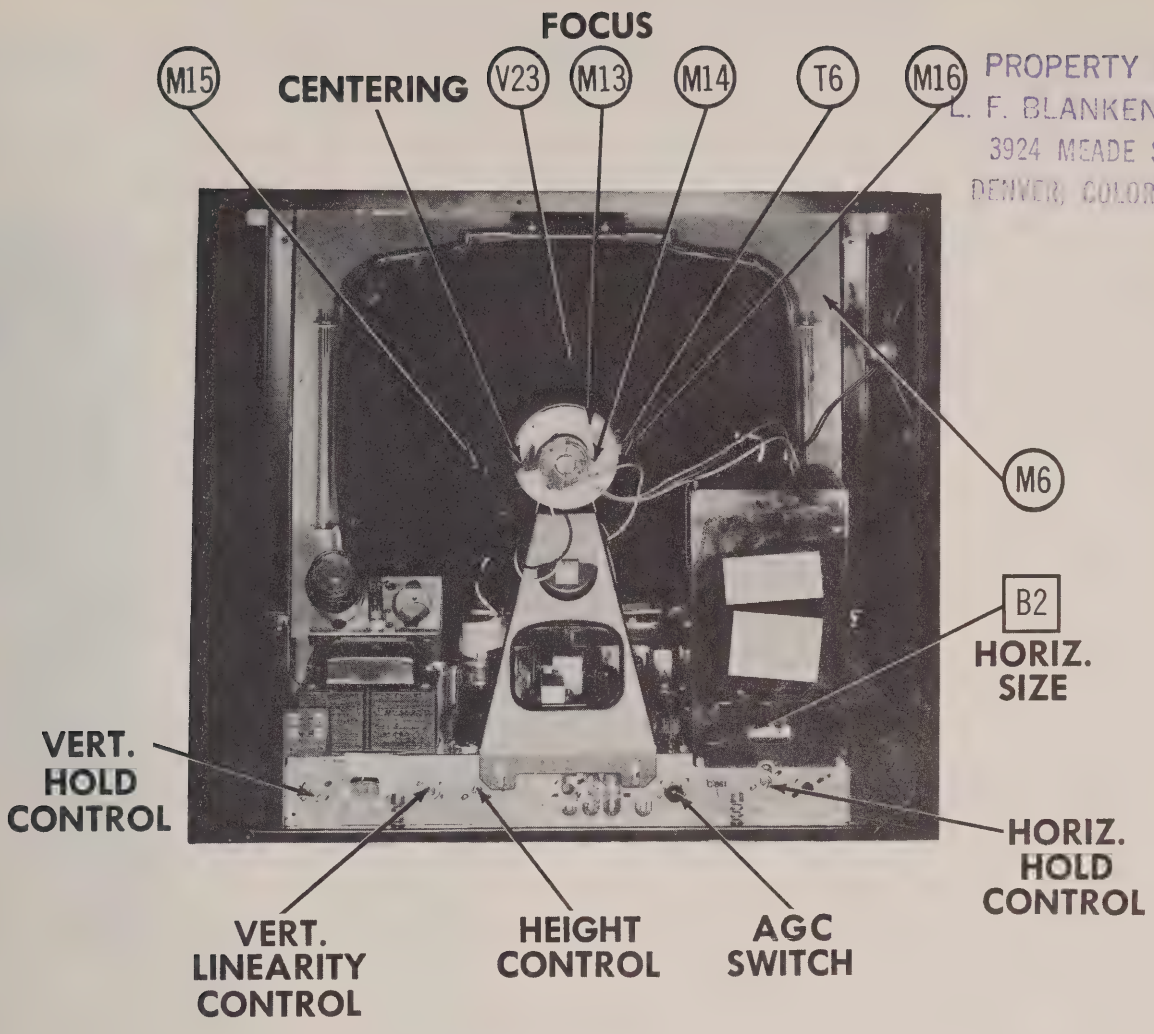
POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, substitute V22. Check M1 fuse. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Substitute V22. Check B+ filter and decoupling network.



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CABINET—REAR VIEW

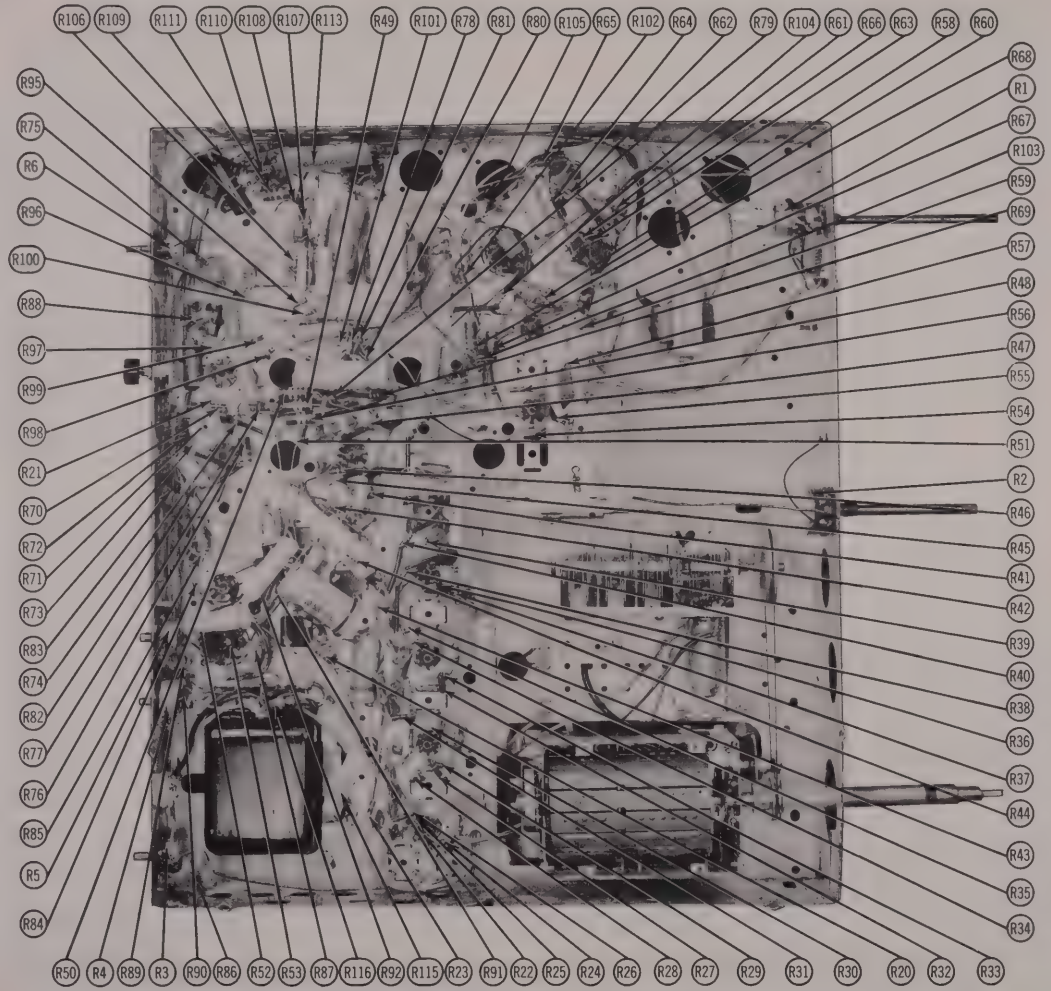
HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV station.

Adjust the horizontal size slug (B2) for a picture slightly wider than necessary to fill the picture mask horizontally.

To adjust the horizontal AFC circuit proceed as follows:

1. Short pin 2 (plate) of 6AL5 (V17) to chassis.
2. Connect DC probe of VTVM to pin 4 (grid) of 6SN7GTA (V18). Common to chassis.
3. Adjust "sync balancing" trimmer (B3) for MINIMUM deflection. Remove VTVM.
4. Set horizontal hold control to its mid-range position and adjust horizontal frequency slug (B1) until picture moves back and forth across screen with blanking bar in a vertical position.
5. Remove short from pin 2 of V17.
6. Set contrast control fully counter clockwise and turn the horizontal hold control for best picture lock in action.
7. Set contrast control for normal contrast and check for proper lock-in on all available channels. If necessary, slightly readjust the horizontal hold control.



CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION

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SYLVANIA MODELS 410 Series, 410 "Ul" Series, 514 Series, 514 "Ul" Series, 525 Series, 525 "Ul" Series, 529 Series, 529 "Ul" Series (Ch. 1-530-1, -2, -3, -4, -5, -6)

PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: SYLVANIA PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	UHF Osc.	6J6	6J6	7BF	
V2	RF Amp.	6BK7A	6BK7A	9AJ	
V3	Mixer -Osc.	6J6	6J6	7BF	
V4	1st Video IF Amp.	6CB6	6CB6	7CM	
V5	2nd Video IF Amp.	6CB6	6CB6	7CM	
V6	3rd Video IF Amp.	6CB6	6CB6	7CM	
V7	4th Video IF Amp.	6CB6	6CB6	7CM	
V8	Video Output	12BY7	12BY7	9BF	
V9	Sound IF Amp.	6AU6	6AU6	7BK	
V10	Ratio Detector	6AL5	6AL5	6BT	
V11	AF Amp.	6AV6	6AV6	7BT	
V12	Audio Output	6Y6G	6Y6G	7S	
V13	Sync Sep-Sync Phase Inv.	12AU7	12AU7	9A	
V14	Sync Limiter - Noise Inv.	12AU7	12AU7	9A	
V15	Vert. Osc.	6C4	6C4	6BG	
V16	Vert. Output	6AH4GT	6AH4GT	8EL	
V17	Horiz. AFC	6AL5	6AL5	6BT	
V18	Horiz. Mult.	6SN7GTA	6SN7GTA	8BD	
V19	Horiz. Output	6BQ6GT	6BQ6GT	6AM	
V20	Damper	6AX4GT	6AX4GT	4CG	
V21	HV Rectifier	1B3GT	1B3GT	3C	
V22	LV Rectifier	5U4G	5U4G	5T	

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[illegible]0

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: SYLVANIA PART No.	CBS-HYTRON PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V23	21WP4/ 21WP4A ③ 21ZP4B ③	21WP4/ 21WP4A ① 21ZP4B ① 21ZP4A	21ZP4B ① 21ZP4A	21WP4/ 21WP4A③ 21ZP4B ③ 21ZP4A 21ZP4 ②	21ZP4B ① 21ZP4A	12N 12N 12N 12D	① Aluminized ② Circuit Changes Necessary ③ Silver Screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: SYLVANIA PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C1A	▲40	400	161-2004			FP264.5	TM-8040-450	D-255	
B	▲80	400							
C2	2	50	161-1001			TC302	TD-2-50	MMT-0505	
C3	2	50	161-1001			TC302	TD-2-50	MMT-0505	
C4A	▲20	350	161-3017				TM-D150-250	D-100	
B	■100	200					TD-20-350	FM-4520	
C	▲100	200							
C5A	▲40	400	161-2005			FP229.6	TM-3056	T-535	
B	▲100	50							
C6	10	500	161-1010			TC82	TD-10-500	S-310	
C7	2	50	161-1001			TC302	TD-2-50	MMT-0505	
C8	4.7			TCZ-4R7	NP0A-4R7	ZT-555			
C9	4.7			TCZ-4R7	NP0A-4R7	ZT-555			
C10	4.7			TCZ-4R7	NP0A-4R7	ZT-555			
C11	800			DD-801	831-801	DC-521			
C12	800			MFT-1000					
C13	800			MFT-1000					
C14	10			DD-100	831-100	UC-541			
C15	33			DD-330	831-330	UC-5433			
C16	100			TCN-100	N750L-101	NT-531			
C17	5			TCZ-4R7	NP0A-050	ZT-555			
C18	800			MFT-1000					
C19	1.8				NP0A-1R8				
C20	800			DD-801	831-801	DC-521			
C21	47			DD-470	831-471	UC-5447			
C22	800			DD-801	831-801	DC-521			
C23	800			MFT-1000					
C24	47			DD-470	831-470	UC-5447			
C25	10			TCN-10	N750K-100	NT-541			
C26	10			TCN-10	N750K-100	NT-541			
C27	800			DD-801	831-801	DC-521			
C28	10			TCZ-10	NP0K-100	ZT-541			
C29	10			TCZ-10	NP0K-100	ZT-541			
C30	1.5			TCZ-1R5	NP0A-1R5	ZT-5515			
C31	800			MFT-1000					
C32	800			MFT-1000					
C33	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C34	270		166-0270N	D6-271	GP2K-271	UC-5327		K-1327	
C35	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C36	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C37A	4700		168-001ID	DD2-502	811-0047	DC-525		C-1247	
B	4700				811-0047	DC-525		C-1247	
C38	1000		166-1000D	DD-102	801-001	DC-521		K-1210	
C39	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C40	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C41	.22	200	160-0202			PT4022	IMP2-P22	3302022	
C42A	4700		168-001ID	DD2-502	811-0047	DC-525		C-1247	
B	4700				811-0047	DC-525		C-1247	
C43	1000		166-1000D	DD-102	801-001	DC-521		K-1210	
C44	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C45A	4700		168-001ID	DD2-502	811-0047	DC-525		C-1247	
B	4700				811-0047	DC-525		C-1247	
C46	270		166-0270N	D6-271	GP2K-271	UC-5327		K-1327	
C47	1000		166-1000D	DD-102	801-001	DC-521		K-1210	
C48	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C49	4.7		168-0008N	TCZ-4R7	NP0A-4R7	ZT-555		KR-1550	
C50	4700		166-4700D	DD-472	811-0047	DC-525		C-1247	
C51	4700		166-4700 D	DD-472	811-0047	DC-525		C-1247	
C52	270		166-0270N	D6-271	GP2K-271	UC-5327		K-1327	
C53	1000		166-1000D	DD-102	801-001	DC-521		K-1210	
C54	43		166-0043P	TCZ-43	NP0L-430			KR-1443	

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PARTS LIST AND DESCRIPTIONS (Continued)

CAPACITORS (cont)

ITEM No.	RATING CAP	RATING VOLT	REPLACEMENT DATA SYLVANIA PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C85	10		186-0010P	TC Z-10	MPGE-100	ZT-541		KR-1410	
C86	10		186-0010P	TC Z-10	MPGE-100	ZT-541		KR-1410	
C87	.22	200	182-0202			PT4022	IMP2-P22	33C2022	
C88	.1	600	180-0201	DF-104		PT401	IMP4-P1	330401	
C89	4.7		188-0008M	TCS-4R7	MPGA-4R7	ET-556		KR-1550	
C90	.22	400	182-0202A			PT4022	IMP4-P22	33C4022	
C91	.01	200	180-0401	D6-103	GP2-333-103	PT401	IMP6-01	330411	
C92	4.7		188-0008M	TCS-4R7	MPGA-4R7	ET-556		KR-1550	
C93	.01		186-0010P	TC5-10	MPGE-100	ET-541		KR-1410	
C94A	4700		186-0012D	DD-502	811-0047	DC-526		C-1547	
B	4700				811-0047	DC-526		C-1547	
C95A	220			DD-221	GP2K-221	DC-5233		K-1333	
B	680		7190-0022	DD-681	GP2K-681	DC-5268		K-1368	
C	10000			DD-103	811-01	DC-521		330611	
C96	.01	200	180-0411	D6-103	GP2-333-103	PT4113	IMP4-01	330411	
C97	100	200	182-0100	D6-101	GP1K-101	MC5233		K-1310	
C98	.01	600	180-0611	D6-103	GP2-333-103	PT611S	IMP6-01	330611	
C99	.015	600	180-0615			PT615S	IMP6-015	330615	
C99	.0047	600	180-0474T	D6-472	GP2-333-472	PT6347	IMP6-D47	3306347	
C71	330	500	183-0330	D6-331	GP2K-331	MC-5233		K-1333	
C72	.047	200	180-0474T	DF-503		PT4747	IMP2-P47	330347	
C73	.01	600	180-0611	D6-103	GP2-333-103	PT611	IMP6-01	330611	
C74	.1	600	180-0601	DF-104		PT601	IMP6-P1	330601	
C75	.01	200	180-0411	D6-103	GP2-333-103	PT411	IMP4-01	330411	
C76	.0033	600	182-0633A	D6-333	GP2-333-333	PT6333	IMP6-D33	3306333	
C77A	3000			DC-522		DC-522	IMP6-D3	C-1320	
B	5000		4190-0012	◆ PC-100	◆ 1405-01	DC-525	IMP6-D5	C-1350	
C	5000			DC-525		DC-525	IMP6-D5	C-1350	
C78	.0033	600	182-0633	D6-222	GP2-333-222	PT6222	IMP6-D22	3306222	
C79	.0033	600	182-0633	D6-333	GP2-333-333	PT6333	IMP6-D33	3306333	
C80	.047	600	182-0647	DF-503		PT6347	IMP6-D47	3306347	
C81	.0047	600	180-0634T	D6-472	GP2-333-472	PT6347	IMP6-D47	3306347	
C82	.1	400	180-0401	DF-104		PT401	IMP4-P1	330401	
C83	.001	400	180-0421	D6-102	GP2L-102	PT421	IMP4-D1	330421	
C84	.001	400	180-0421	D6-102	GP2L-102	PT621	IMP6-D1	330621	
C85	.0047	600	180-0634T	D6-472	GP2-333-472	PT6347	IMP6-D47	3306347	
C86	.001	200	180-0431	D6-102	GP2L-102	PT621	IMP6-D1	330621	
C87	.01	200	180-0411	D6-103	GP2-333-103	PT411	IMP4-01	330411	
C88	.0047	600	180-0634T	D6-472	GP2-333-472	PT6347	IMP6-D47	3306347	
C89	330	500	183-0330					KR-1333	
C90	680	500	183-0680					KR-1368	
C91	1000		186-1000D	D6-102	GP2L-102	UC-521		K-1210	
C92	150	500	183-0150	TC2-150	MPG-334-151	MC5236		KR-1315	Note 1
C93	.1	400	180-0601	DF-104		PT401	IMP4-P1	330401	
C94	1000		186-1000D	DD-102	811-001	DC-521		K-1210	
C95	.33	600	180-0633			PT6332	IMP6-P33	3306032	
C96	.1	600	180-0601	DF-104		PT601	IMP6-P1	330601	
C97	56	3000	174-0056	CD30-560	KEV-560	DC-30456		K-4556	
C98	33		186-0033P						Note 2
C99			186-0003P						Note 2

Note 1. Some versions use a 75-475AMF variable trimmer in this application (part #173-0023).
Note 2. Not used in later production.
◆ Items C85A, C85B, C86C, R87 are combined in one unit.
◆ Items C77A, C77B, C77C, R85A and R83B are combined in one unit.
◆ Remove R85 and connect lead lead of replacement unit to pin 1 of V13.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA SYLVANIA PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	127-0034	*QJ-S13				Brightness - Panel
B	1Meg	½						Volume & Switch - Rear
R2A	1000Ω	2	153-2010	WK-1000	A43-1000	**V-128	H1000L	Contrast (Wire wound)
B	Not Req.		Not Req.	C3	E38-5		D8-36	Attach to R2A
R3A	1000Ω	2	153-3013	WK-1000	A43-1000		H1000L	Contrast (Wire wound) - Note
B	Shaft		Not Req.	C3	E38-5		D8-36	Attach to R3A
R3A	2Meg	½	153-0018	QU-139	A47-2Meg-S	AB-75	SU-56	Vert. Hold
B	Shaft		Not Req.	Not Req.	FE3-1/4	AK-1	Not Req.	Attach to R3A
R4A	250KΩ	½	153-3011	WK-X500	A47-3000-S	AB-7	K1500L	Vert. Linearity
B	Shaft		Not Req.	Not Req.	FE3-1/4	AK-1	Not Req.	Attach to R4A
R5A	1.5Meg	½	153-0014	QU-138	A47-2Meg-S	AB-75	U-155	Height
B	Shaft	½	Not Req.	Not Req.	FE3-1/4	AK-1	Not Req.	Attach to R5A
R6A	50KΩ	½	153-0031	QU-133	A47-50K-S	AB-31	U-36	Horiz. Hold
B	Shaft		Not Req.	Not Req.	FE3-1/4	AK-4	Not Req.	Attach to R6A

* CONCENTRIKIT EQUIVALENT: KIT K-3, BASE ELEMENTS & SHAFTS: Bil-137 & Pl-324 (PANEL)
Bil-137 & R16-414 (REAR)

Note: Used in chassis 1-530-1 and 1-530-2 only.
** Cut off shaft on original control. Use coupler AK-16 to make same shaft length as original.

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA SYLVANIA PART No.	IRC PART No.	NOTES
R1	5600Ω	½		BTS-5600	
R2	4700	½		BTS-4700	
R3	2700	½		BTS-2700	
R50	470	½		BTS-47	
R51	39000	½		BTS-3900	
R12	2.2Meg	½		BTS-2.2Meg	
R13	1.5Meg	½		BTS-1.5Meg	
R14	4700	½		BTS-470	
R15	10KΩ	½		BTS-10K	
R16	150KΩ	½		BTS-150K	
R17	10KΩ	½		BTS-10K	
R18	10KΩ	½		BTS-10K	
R19	47000	½		BTS-4700	
R20	2700Ω	2	182-0272	BTB-2700	
R21	68KΩ	½	181-0683	BTS-68K	
R23	3700Ω	½	181-0372	BTS-3700	Note 1
R25	1000Ω	½	181-0102	BTS-1000	
R34	470 5%	½	181-04705	BTS-47 5%	
R35	4700Ω	½	181-0472	BTS-4700	
R36	1000Ω	½	181-0102	BTS-1000	
R37	150Ω	½	181-0151	BTS-150	
R38	180Ω	½	181-0181	BTS-180	
R39	1000Ω	½	181-0102	BTS-1000	
R40	100Ω	½	181-0101	BTS-100	
R41	1000Ω	½	181-0102	BTS-1000	
R42	1000Ω	½	181-0102	BTS-1000	
R43	4700Ω	½	181-0472	BTS-4700	
R44	330KΩ	½	181-0334	BTS-330K	
R45	470KΩ	½	181-0474	BTS-470K	
R46	47Ω	½	181-0470	BTS-47	
R47	6800Ω	½	181-0682	BTS-6800	
R48	33KΩ	½	181-0333	BTS-33K	
R49	12KΩ	½	181-0123	BTS-12K	
R50	12KΩ	½	181-0123	BTS-12K	
R51	330KΩ	½	181-0334	BTS-330K	
R52	180KΩ 5%	½	181-01845	BTS-180K 5%	
R53	100KΩ	½	181-0104	BTS-100K	
R54	47KΩ	½	181-0473	BTS-47K	
R55	100Ω	½	181-0101	BTS-100	
R56	1000Ω	½	181-0102	BTS-1000	
R57	100KΩ	½	7190-0013	BTS-100K	
R58	180Ω	½	181-0183	BTS-180	
R59	15Meg	½	181-0156	BTS-15Meg	
R60	330KΩ	½	181-0334	BTS-330K	
R61	100KΩ 5%	½	181-01045	BTS-100K 5%	
R62	180KΩ 5%	½	181-01845	BTS-180K 5%	
R63	100KΩ	½	181-0104	BTS-100K	
R64	68Ω	½	182-0580		
R65	10KΩ	½	181-0103	BTA-10K	
R66	47Ω	½	181-0470	BTS-47	
R67	68Ω	2	183-0681	BTB-680	
R68	680Ω	2	183-0681	BTB-680	
R69	33KΩ	½	181-0333	BTS-33K	
R70	2.7Meg	½	181-0275	BTS-2.7Meg	
R71	470KΩ	½	181-0474	BTS-470K	
R72	330KΩ	½	181-0334	BTS-330K	
R73	120KΩ	½	181-0124	BTS-120K	
R74	22KΩ	½	181-0223	BTS-22K	
R75	2200Ω	½	181-0222	BTS-2200	
R76	6800Ω	2	183-0682	BTB-6800	
R77	3300Ω	½	182-0332	BTA-3300	
R78	180KΩ	½	181-0184	BTS-180K	
R79	470KΩ	½	181-0474	BTS-470K	
R80	100KΩ	½	181-0104	BTS-100K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA SYLVANIA PART No.	IRC PART No.	NOTES
R81	23Meg	½	181-0226	BTS-23Meg	
R82	22KΩ	½	181-0223	BTS-22K	
R83A	8300Ω	½		BTS-8300	
B	8300Ω	½		◆190-0013	
R84	33KΩ	½	181-0333	BTS-33K	
R85	220KΩ	½	181-0224	BTS-220K	
R86	1.5Meg	½	181-0155	BTS-1.5Meg	
R87	680KΩ	½	181-0684	BTS-680K	
R88	100KΩ	½	181-0104	BTS-100K	
R89	470KΩ	½	181-0474	BTS-470K	
R90	1000Ω	1	182-0102	BTA-1000	
R91	83000 5%	½	181-03835	BTS-8300 5%	
R92	33000Ω	½	181-0333	BTS-3300	
R93	560Ω	½	181-0561	BTS-560	
R94	560Ω	½	181-0561	BTS-560	
R95	13KΩ	½	181-0133	BTS-13K	
R96	82KΩ	½	181-0823	BTS-82K	
R97	27KΩ	½	181-0273	BTS-27K	
R98	100KΩ	½	181-0104	BTS-100K	
R99	100KΩ	½	181-0104	BTS-100K	
R100	4.7Meg	½	181-0475	BTS-4.7Meg	
R101	4.7Meg	½	181-0475	BTS-4.7Meg	
R102	820Ω	½	181-0821	BTS-820	
R103	5600Ω	1	182-0562	BTA-5600	
R104	130KΩ	½	181-0134	BTS-130K	
R105	82KΩ	½	181-0823	BTS-82K	
R106	4700Ω	½	181-0472	BTS-4700	
R107	470KΩ	½	181-0474	BTS-470K	
R108	1000Ω	½	181-0102	BTS-1000	
R109	120Ω	2	183-0131		
R110	100Ω	½	181-0101	BTS-100	
R111	12KΩ	2	183-0123	BTB-12K	
R112	1000Ω	½	181-0102	BTS-1000	
R113	560Ω	10	189-0047		
R114	4.3Ω	½	189-0007		
R115	68Ω	10	197-0013		
R116	100KΩ	2	183-0104	BTB-100K	
R117	180KΩ	2	183-0184	BTB-180K	Note 2
R118	130KΩ	2	183-0134	BTB-130K	Note 2

PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS (cont)

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA SYLVANIA PART No.	IRC PART No.	NOTES
R41	15KΩ	½	181-0133	BTS-13K	
R43	4700Ω	½	181-0472	BTS-4700	
R44	330KΩ	½	181-0334	BTS-330K	
R45	330KΩ	½	181-0334	BTS-330K	
R46	470Ω	½	181-0474	BTS-470K	
R47	6800Ω	½	181-0682	BTS-6800	
R48	13KΩ	2	183-0133	BTB-13K	
R49	12KΩ	½	183-0058	BTB-12K	
R50	12KΩ	½	183-0058	BTB-12K	
R51	330KΩ	½	181-0334	BTS-330K	
R52	1Meg	½	181-0584	BTS-1Meg	
R53	180KΩ	½	181-0184	BTS-180K	
R54	47KΩ	½	181-0473	BTS-47K	
R55	100Ω	½	181-0101	BTS-100	
R56	1000Ω	½	181-0102	BTS-1000	
R57	100KΩ	½	7190-0013	BTS-100K	
R58	180Ω	½	181-0183	BTS-180	
R59	15Meg	½	181-0156	BTS-15Meg	
R60	330KΩ	½	181-0334	BTS-330K	
R61	100KΩ 5%	½	181-01045	BTS-100K 5%	
R62	180KΩ 5%	½	181-01845	BTS-180K 5%	
R63	100KΩ	½	181-0104	BTS-100K	
R64	68Ω	1	182-0580		
R65	10KΩ	½	181-0103	BTA-10K	
R66	47Ω	½	181-0470	BTS-47	
R67	68Ω	2	183-0681	BTB-680	
R68	680Ω	2	183-0681	BTB-680	
R69	33KΩ	½	181-0333	BTS-33K	
R70	2.7Meg	½	181-0275	BTS-2.7Meg	
R71	470KΩ	½	181-0474	BTS-470K	
R72	330KΩ	½	181-0334	BTS-330K	
R73	120KΩ	½	181-0124	BTS-120K	
R74	22KΩ	½	181-0223	BTS-22K	
R75	2200Ω	½	181-0222	BTS-2200	
R76	6800Ω	2	183-0682	BTB-6800	
R77	3300Ω	½	182-0332	BTA-3300	
R78	180KΩ	½	181-0184	BTS-180K	
R79	470KΩ	½	181-0474	BTS-470K	
R80	100KΩ	½	181-0104	BTS-100K	

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA SYLVANIA PART No.	IRC PART No.	NOTES
R81	23Meg	½	181-0226	BTS-23Meg	
R82	22KΩ	½	181-0223	BTS-22K	
R83A	8300Ω	½		BTS-8300	
B	8300Ω	½		◆190-0013	
R84	33KΩ	½	181-0333	BTS-33K	
R85	220KΩ	½	181-0224	BTS-220K	
R86	1.5Meg	½	181-0155	BTS-1.5Meg	
R87	680KΩ	½	181-0684	BTS-680K	
R88	100KΩ	½	181-0104	BTS-100K	
R89	470KΩ	½	181-0474	BTS-470K	
R90	1000Ω	1	182-0102	BTA-1000	
R91	83000 5%	½	181-03835	BTS-8300 5%	
R92	33000Ω	½	181-0333	BTS-3300	
R93	560Ω	½	181-0561	BTS-560	
R94	560Ω	½	181-0561	BTS-560	
R95	13KΩ	½	181-0133	BTS-13K	
R96	82KΩ	½	181-0823	BTS-82K	
R97	27KΩ	½	181-0273	BTS-27K	
R98	100KΩ	½	181-0104	BTS-100K	
R99	100KΩ	½	181-0104	BTS-100K	
R100	4.7Meg	½	181-0475	BTS-4.7Meg	
R101	4.7Meg	½	181-0475	BTS-4.7Meg	
R102	820Ω	½	181-0821	BTS-820	
R103	5600Ω	1	182-0562	BTA-5600	
R104	130KΩ	½	181-0134	BTS-130K	
R105	82KΩ	½	181-0823	BTS-82K	
R106	4700Ω	½	181-0472	BTS-4700	
R107	470KΩ	½	181-0474	BTS-470K	
R108	1000Ω	½	181-0102	BTS-1000	
R109	120Ω	2	183-0131		
R110	100Ω	½	181-0101	BTS-100	
R111	12KΩ	2	183-0123	BTB-12K	
R112	1000Ω	½	181-0102	BTS-1000	
R113	560Ω	10	189-0047		
R114	4.3Ω	½	189-0007		
R115	68Ω	10	197-0013		
R116	100KΩ	2	183-0104	BTB-100K	
R117	180KΩ	2	183-0184	BTB-180K	Note 2
R118	130KΩ	2	183-0134	BTB-130K	Note 2

Note 1: Some versions use a 2200Ω resistor in this application.
Note 2: Not used in some versions.

◆ Items R87, C85A, C85B and C86C are combined in one unit.
◆ Items R83A, R83B, C77A, C77B and C77C are combined in one unit.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	RATING SEC. 3	RATING SEC. 4	RATING SEC. 5	SYLVANIA PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @ 1.65A	850VCT .330ADC	5VAC @ 3A	6.3VAC @ 1.19A	6.3VAC @ 8A	5VAC	141-0039 141-0040 ①						

① Power trans. Used in later production, has 6A rectifier filament winding.

TRANSFORMER (HALOLIGHT)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	SYLVANIA PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T2	117VAC @ .16A	1140VAC		141-0030		P-3095①			22R42 ①	

① Drill new mounting hole.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	SYLVANIA PART No.	Halldorson PART No.	Merit PART No.	RCA PART No.	Ram PART No.	Stancor TYPE No.	Thordarson PART No.	Triad PART No.
T3	Vert. Osc. Trans.	242-0002	B6702	A-3063	209T1 ①	V405	A-8125	36A03	A-97X
T4	Horiz. Output Trans.	241-0019			X100 & 201R18 *①	X100 & 201R18 *	A-8254 & WC-5 * ① ②	FLY-37 & 22R42 * ① ②	46D-25 & WC-18 * ① ②	WC-12 * ① ②
T5	Vert. Output Trans.	241-0008	X1803	A-3035	204T2 ①	V308	A-8121	36B31	A-99X ①	
T6A	Yoke-Horiz. (70MED	241-0009 ③	X1805	A-3038		V302 ①	A-8142 ①	36B72	A-102X	
B	Vert. (90MED	190-0009								
T7	Width Coil (8-8.5MHz)	152-0005		1WWC-6 ④	X1M1	302R15	WC-8	WC-23	WC-12 ④	

① Drill new mounting hole(s).
② Alternate vertical output transformer.
③ Enlarge mounting hole.
④ Connect to coded blue and green terminals.
⑤ CAUTION . Certain rivets on top of plastic sub-assembly board are at B+ or boosted B+ potential. Avoid contacting these rivets with metal brackets of replacement units.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type is Listed

	ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	RCA Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
	7			10	13	5	13	10
	6			Jumper 12 & 11	Jumper 12 & 11	4	Jumper 12 & 11	8
	5			8	7	6	6	7
	4			7	6	4	8	6
	3			3	3	3	1 (Also see Note ⑦)	3
	2			2	9	2	9	2
	1			1	8	1	8	1
Connect Width Coil Across	2 & 1		212R1 across 2 & 1	202R16 across 9 & 8	Red & blue terms. of WC-5 across 2 & 1		Red & blue terms. of WC-12 across 2 & 1	Red & blue terms. of WC-12 across 2 & 1
Special Notes				⑥			⑥	⑦

⑥ Connect yoke return (large red lead) to terminal #5.
⑦ Jumper terminals #9 and "T".

TRANSFORMER (AUDIO OUTPUT)

ITEM No	IMPEDANCE PRI.	IMPEDANCE SEC	SYLVANIA PART No	Halldorson PART No	Merit PART No	Stancor PART No	Thordarson PART No.	Triad PART No	NOTES
T8	4.7KΩ	4Ω	143-0023	Z1010	A-3019	A-3849	28S49	S-52	

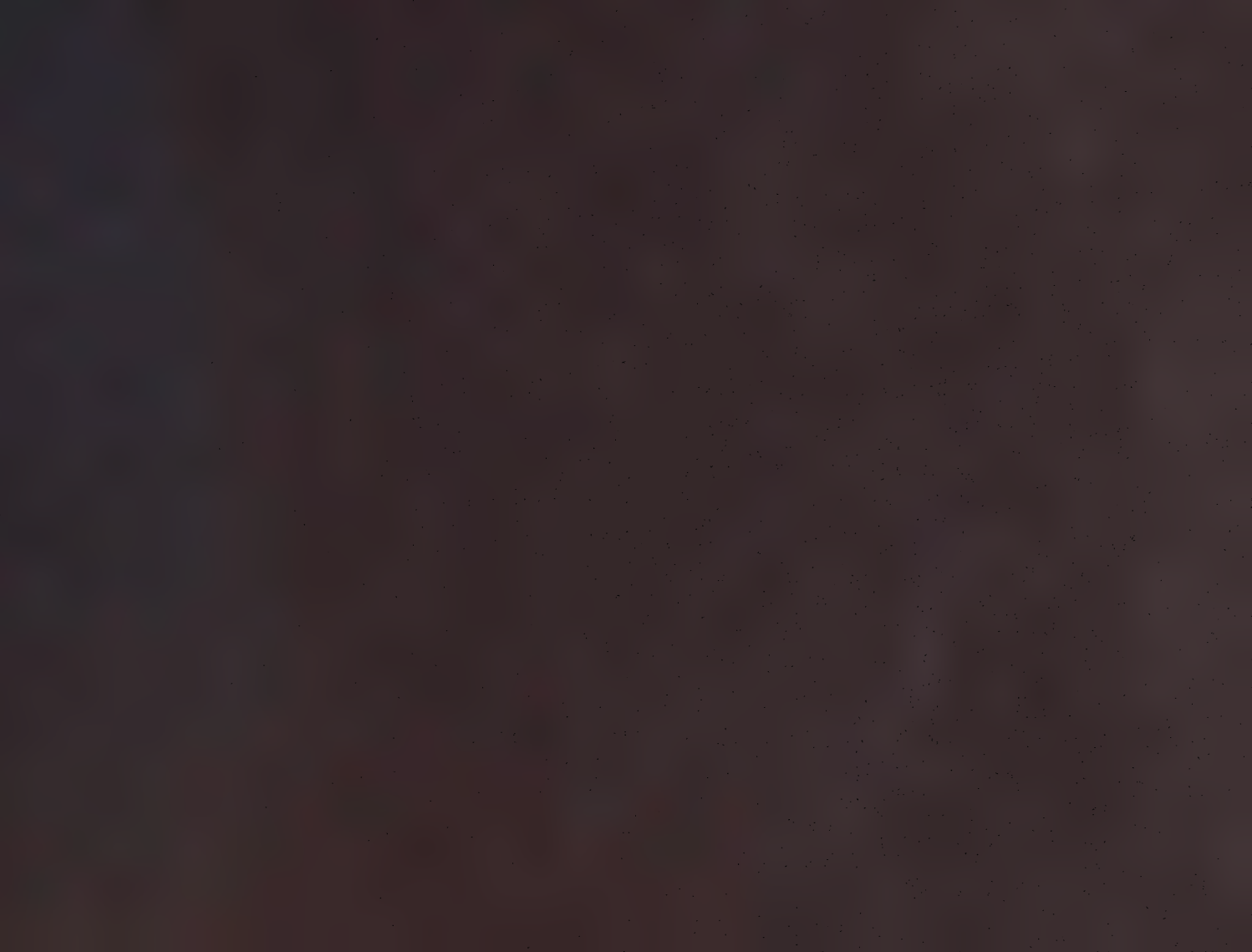
SPEAKER

ITEM No.	RATINGS SIZE	RATINGS FIELD	RATINGS V. C. IMP	SYLVANIA PART No.	QUAM PART No	NOTES
SP1	4" or 6"	PM	4Ω	539-4600 ①	4GA07	① Used in Model 514 Series
	5 3/4"	PM	4Ω	539-0525 ②		② Used in Model 410 Series
	6 1/2"	PM	4Ω	539-0602 ③		③ Used in Model 526 Series
	8"	PM	4Ω	539-0803 ④	8A31	④ Used in Model 529 Series

COILS (RF-IF)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	SYLVANIA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	UHF Ant. Coil	0Ω						
L2	UHF Ant. Coil	0Ω						
L3	UHF Coupling Coil	0Ω						
L4	UHF Coupling Coil	0Ω						
L5	UHF Osc. Doubler Coil	0Ω						
L6	FIL. Choke	0Ω						
L7	UHF Osc. Coil	0Ω	CT					
L8	UHF Osc. Tank Coil	0Ω						
L9	UHF Osc. Tank Shunt Coil	0Ω						
L10	RF Choke	.1Ω						
L11	UHF IF Output	0Ω	0Ω					
L12A	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0002				Channel 2
B	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0003				Channel 3
C	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0004				Channel 4
D	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0005				Channel 5
E	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0006				Channel 6
F	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0007				Channel 7
G	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0008				Channel 8
H	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0009				Channel 9
I	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0010				Channel 10
J	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0011				Channel 11

SYLVANIA MODELS 410 Series, 410 "U" Series, 514 Series, 514 "U" Series, 523 Series, 523 "U" Series, 529 Series, 529 "U" Series (CH. 1-530-1, -2, -3, -4, -5, -6)



PARTS LIST AND DESCRIPTIONS (Continued)

COILS (cont)

ITEM No.	USE	DC RES. PRI.	DC RES. SEC.	REPLACEMENT DATA SYLVANIA PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
K	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0012				Channel 12
L	VHF Ant., RF Mixer Grid & Osc. Coils	0Ω	0Ω	110-0013				Channel 13
L13	Neut. Coil	0Ω						
L14	Feedback Coil	0Ω						
L15	Fil. Choke	0Ω						
L16	RF Coil	0Ω						
L17	Conv. Plate	0Ω	0Ω					
L18	1st. Video IF	0Ω		115-0001				Not used in some versions
L19	Video IF Coupling	.1Ω		119-0002	17-4531 *		6232 ■	Includes 39.75MC trap
L20	2nd. Video IF	.1Ω	.1Ω	119-0003	17-5002	TV-127	6232	Includes 41.25MC trap
L21	Fil. Choke	0Ω		147-0014	19-3001	TV-189	4604	.7 Microhenry
L22	3rd. Video IF	.1Ω	.1Ω	119-0004	17-5003	TV-128	6233	Includes 47.25MC trap
L23	4th. Video IF	.1Ω	.1Ω	119-0005	17-5003 ▲	TV-127 ▲	6234	
L24	Cathode Trap	0Ω	0Ω	118-0011	20-1045	TV-130	6219	
L25	Series Peaking Coil	1.4Ω		118-0010	19-1005		4612	9.6 Microhenries
L26A	Series Peaking Coil	5.5Ω		131-2003	19-3125	TV-184	4644	135 Microhenries
B	Shunt Peaking Coil	7.5Ω		131-2003	19-3250	TV-185	6181	250 Microhenries
L27	4.5MC Trap	5.5Ω		130-0001	20-1005	TV-151	1470	
L28A	Series Peaking Coil	4.2Ω		131-2008	19-3093	TV-181	6177	95 Microhenries
B	Shunt Peaking Coil	9Ω		131-2008	19-3300		4565	330 Microhenries
L29	Sound IF	5.5Ω		130-0001	17-3400	TV-151	1469	
L30	Ratio Det.	12Ω	1.4ΩCT	128-0008	17-3497	TV-115	6205	Tertiary winding -1Ω
L31	Horiz. Osc.	46Ω		132-0001	19-1575	TV-163 †	6210 †	
L32	RF Choke	1.5Ω		118-0010	19-1005		4612	9.6 Microhenries
L33	RF Choke	1.5Ω		118-0010	19-1005		4612	9.6 Microhenries

* Drill mounting holes and use secondary and trap windings.
■ Use secondary and trap windings only.
▲ Detune trap winding.
† Enlarge mounting hole.

FILTER CHOKE

ITEM No.	RATINGS TOTAL DIRECT CURRENT	RATINGS D. C. RESISTANCE	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA SYLVANIA PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L34	.230ADC	41Ω	1.2HY	145-0004	C5037 ①	C-2974	C-2326 ①	26C44 ①	C-23X

① Drill one new mounting hole.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA SYLVANIA PART No. FUSE	SYLVANIA PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1	3AG S/B	½A 250V	191-0016	487-0008	313.500 (3AG-S/B-½A)	357001	MDL ½	4405
M2	3AG S/B	1/4A 125V	191-0014	487-0008	313.250 (3AG-S/B-¼A)	357001	MDL 1/4	4405

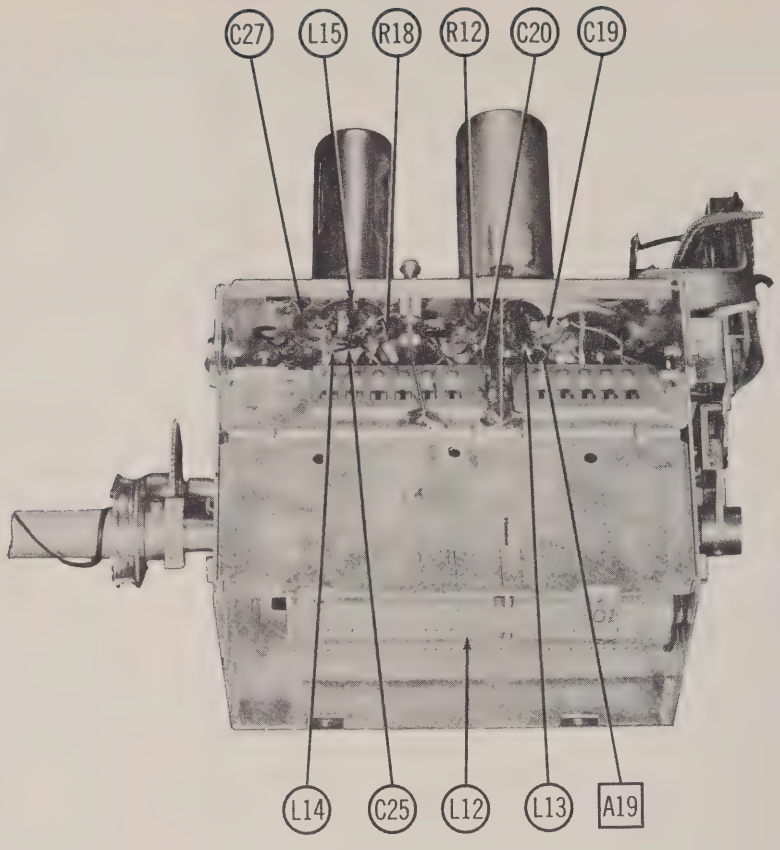
CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA SYLVANIA PART No.	SYLVANIA PART No.		NOTES
M3	G7C*		1N109		Harmonic Generator
M4	1N82A		1N82 or 1N82A		UHF Mixer
M5	1N105		1N105		Video Det.

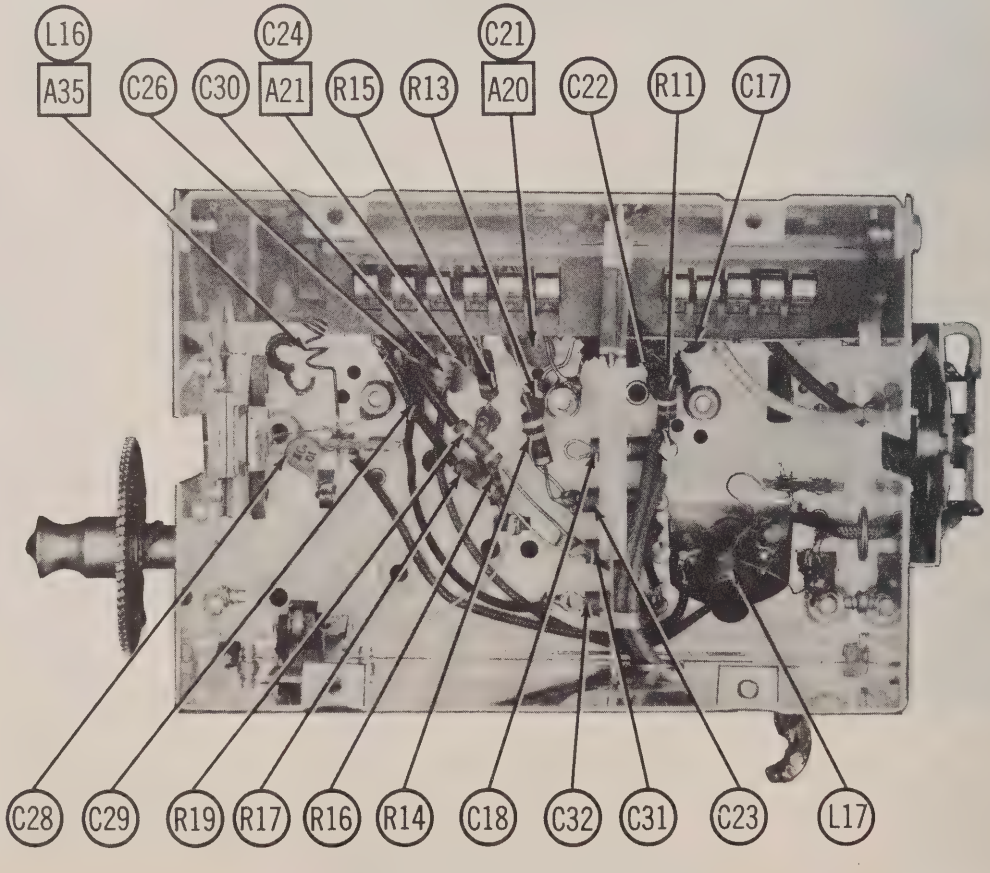
* Some versions may use 1N82 crystal diode in this application.

MISCELLANEOUS

ITEM No.	PART NAME	SYLVANIA PART No.	NOTES
M6	HaloLight	611-2101	Used in 525 Series Models only
M7	Tuner	323-0038	VHF - Chassis 1-530-2 (coded C028 and up), 1-530-4, 1-530-6
	Tuner	323-0045	VHF - Chassis 1-530-1 (coded C028 and up), 1-530-3, 1-530-5
	Tuner	323-0053	VHF - Chassis 1-530-1 (coded C00 - initial production), 1-530-2 (coded C00 and C01)
M8	Tuner	323-0019	UHF- Chassis 1-530-2, -4, -6
M9	Video Det. Assy.	126-0001	Includes M4
M10	Switch	577-0004	VHF-UHF Changeover - Chassis 1-530-2 (coded C02 & up), 1-530-4, 1-530-6
M11	Switch	572-0004	AGC
M12	Switch	571-0009	HaloLight Dimmer - 525 Series Models only
M13	Focus Magnet	400-0014	Includes centering device
M14	Ion Trap	400-0013	
M15	Correction Magnet	400-0016	
M16	Correction Magnet	400-0016	
B3	Trimmer Cap.	172-0032	Sync Balancing (70-470MMF)
	Trimmer Cap.	172-0032	Horiz. Drive (70-470MMF) Not used in later production chassis.
	Knob	744-0023	Brightness
	Knob		VHF Channel Selector - Chassis 1-530-1 (coded C01 and up) 1-530-2 (coded C02 and up), 1-530-3, 1-530-4, 1-530-5, 1-530-6
	Knob	743-0022	VHF Channel Selector - Chassis 1-530-1 (coded C00 - initial production), 1-530-2 (coded C00 and C01)
	Knob	740-0045	Contrast
	Knob	740-0029	Fine tuning
	Knob	740-0038	AGC switch
	Knob	744-0022	Volume, on-off
	Dial	722-0027	UHF Channels - Chassis 1-530-2, -4, -6
	Dial	722-0028	UHF Dummy - Chassis 1-530-1, -3, -5



VHF TUNER-RIGHT SIDE



VHF TUNER-BOTTOM VIEW

TROUBLE SHOOTING AIDS (cont)

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V18, V19, V20 and V21. Check M2 fuse. Check waveform W15.

If Satisfactory	If Unsatisfactory
Check T4, T6A, T7, C95, C93, C94, C96, R111, R109 and other associated components.	Check L31, C88, C89, C91, R105, R103 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V19, V20 and V22. Check R111, R105, C91, C92, T4 and other associated components.

BLOOMING

Check by substitution V19, V20, V21 and V22. Check R111, R110, C91, C92, T4, T6A and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or no Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V2, V3, V4, V5, V6, V7, V8 and V12. Check video IF components for failure or change of value. Raster, No Sound, No Picture, UHF, substitute V1.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

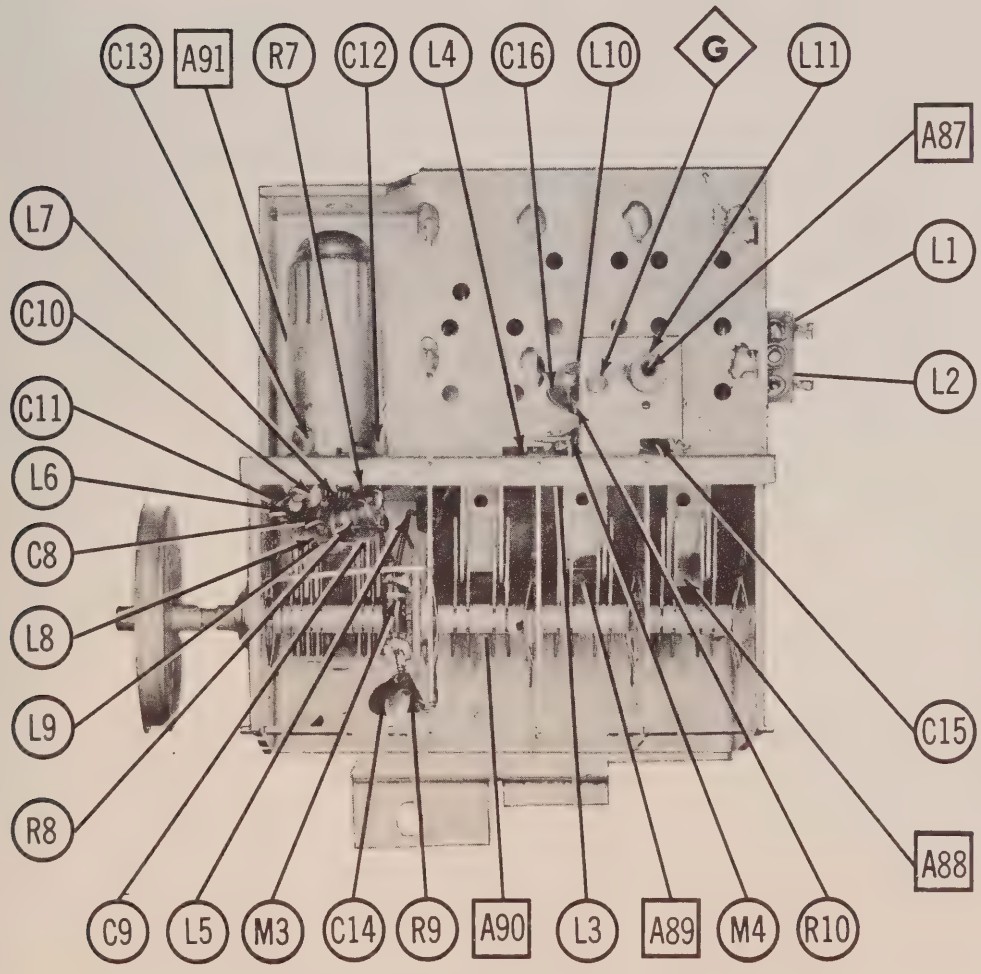
KEYSTONE EFFECT

Check T6 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



UHF TUNER

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removal of the channel selector and fine tuning knobs. The adjustments are accessible, one at a time, thru the small hole in the cabinet to the right of the channel selector shaft.

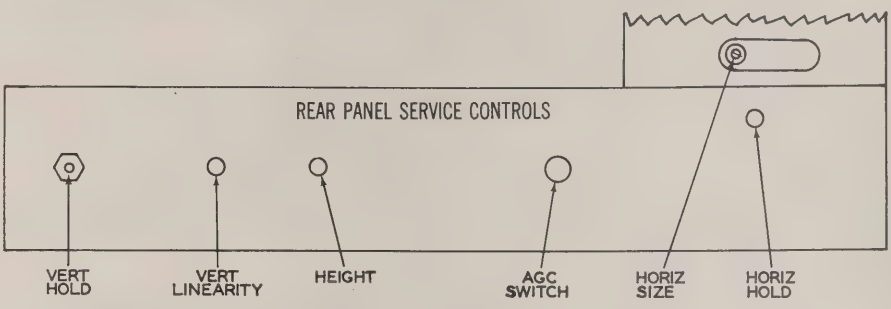
PICTURE TUBE SAFETY GLASS CLEANING

To clean safety glass, remove 3 metal screws holding plastic strip at the top of the safety glass. Remove plastic strip and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube removal it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal oscillator, it is necessary to remove the rear cover and supply power to the set. Adjustment is located on top of the chassis. Set the horizontal hold control at the center of its range and adjust the horizontal frequency slug (L31) until picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate sound IF detector buzz, adjust the ratio detector secondary (L30) located on top of chassis. (See tube placement chart).

FUSES

Two fuses are used. One for horizontal sweep circuit protection and one for LV power supply protection. (For location, see tube placement chart).

CENTERING

Centering is accomplished mechanically by means of a centering lever on the PM focusing assembly. Adjust the centering lever from side to side, and up and down until the picture is properly centered.

ANTI-PIN CUSHION ADJUSTMENT

Reduce the picture size so that the sides of the raster are visible, and position the magnets so that all sides are straight lines and the corners are at right angles.

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 5 push-on type control knobs from front panel of cabinet.
2. Remove 6 metal screws. Remove rear cover.
3. Disconnect speaker and yoke plugs.
4. Remove 2 hex nuts from top of picture tube bracket.
5. Remove 4 chassis bolts. Remove chassis.
6. Remove 2 speaker nuts. Remove speaker.

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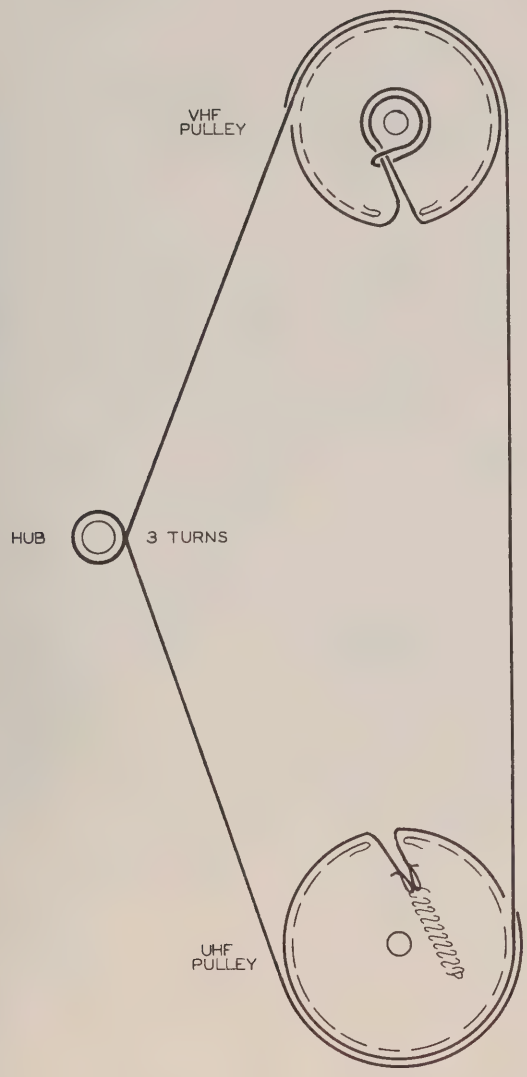
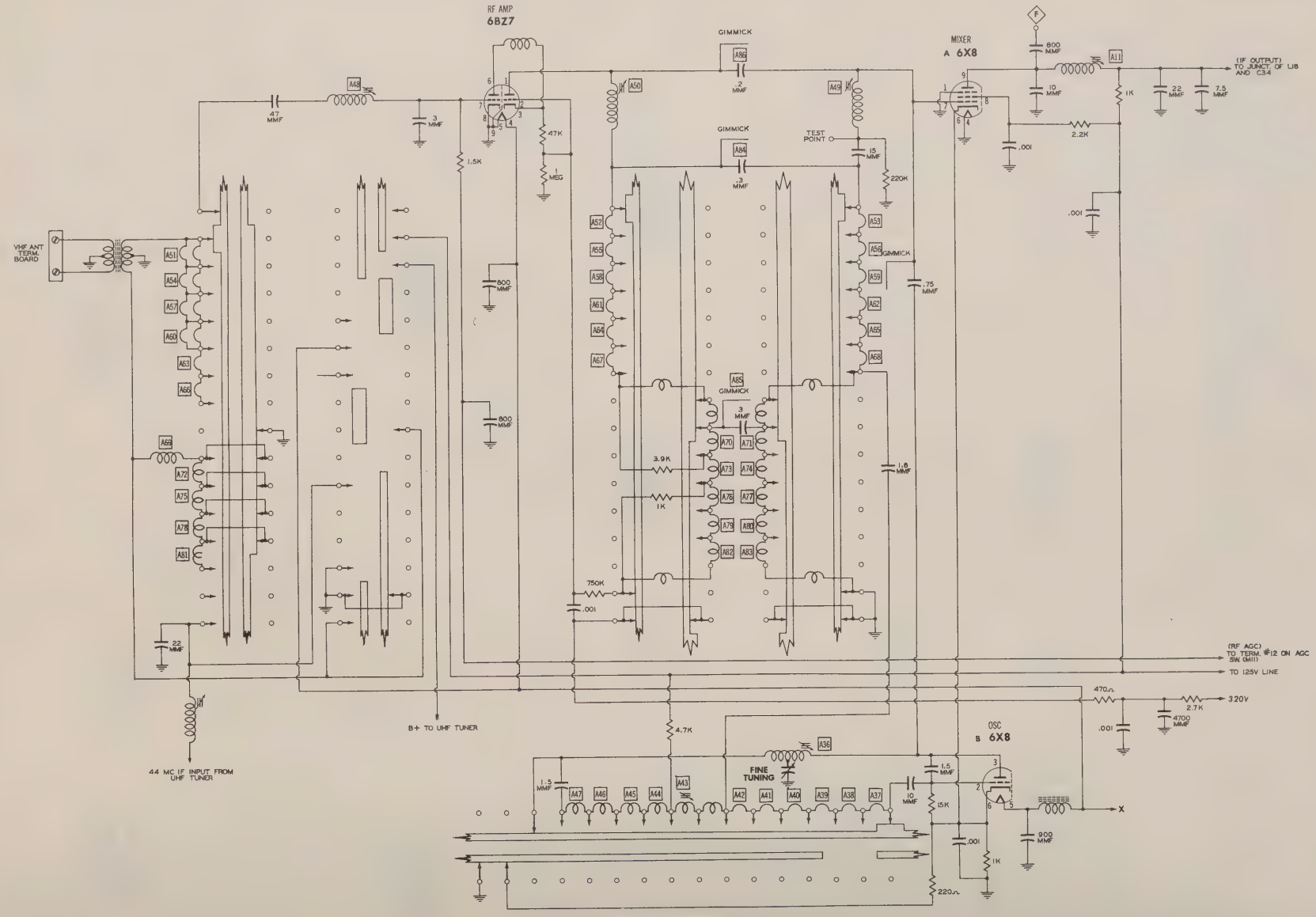
[illegible] ST.
[illegible]



UHF PULLEY FULLY COUNTER CLOCKWISE

UHF DRIVE CORD STRINGING



CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION

VHF TUNER 323-0053 USED WITH CHASSIS 1-530-1, -2

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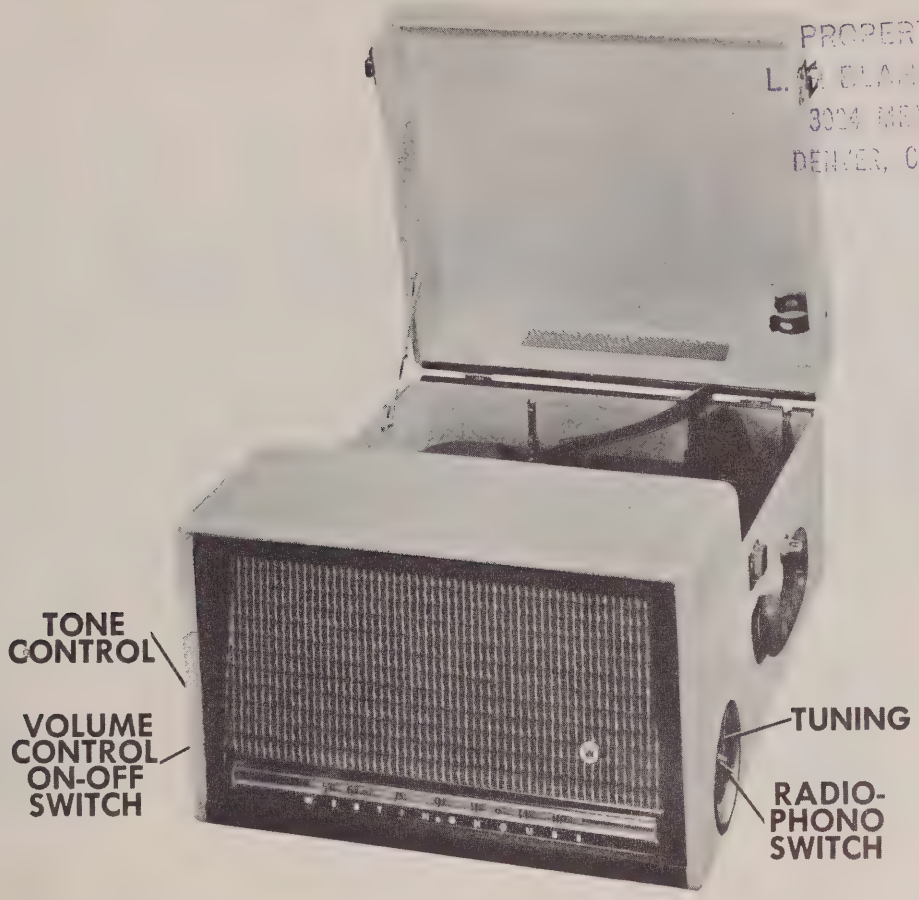
ALTERNATE TUNER SCHEMATIC

WESTINGHOUSE
MODEL H-482PR5 (Ch. V-2229-5)

PROPERTY OF
L. V. BLANKENSHIP
3024 MEADE ST.
DENVER, COLORADO

WESTINGHOUSE
MODEL H-482PR5 (Ch. V-2229-5)



WESTINGHOUSE
MODEL H-482PR5 (Ch. V-2229-5)

TRADE NAME	Westinghouse Model H-482PR5 (Ch. V-2229-5)
MANUFACTURER	Westinghouse Electric Corp., TV-Radio Div., Metuchen, N.J.
TYPE SET	AC Operated Radio-Phono Combination Superheterodyne Receiver With 3 Speed Automatic Record Changer
TUBES (Five)	Types 12BE6 Conv., 12BA6 IF Amp., 12AV6 Det.-AVC-AF Amp., 50L6GT Output, 35Z5GT Rectifier
POWER SUPPLY	105-120 Volts AC-60 Cycles — RATING .26 Amp. @ 117 Volts AC
TUNING RANGE—BROADCAST	540-1600KC

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.
Loop should be maintained in same relative position to chassis as when receiver is in cabinet.
Use isolation transformer, if available. If not, connect a .1MFD capacitor in series with low side of signal generator and B-.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	200MMF	High side to antenna terminal lug. Low side to B-.	455KC (400~Mod)	Tuning gang fully open	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	"	"	1625KC	"	"	A5	"
3.		Loop (Radiated)	1400KC	1400KC	"	A6	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

RECORD CHANGER UNIT - MODEL V-15123

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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PARTS LIST AND DESCRIPTIONS

WESTINGHOUSE
MODEL H-482PR5 (Ch. V-2229-5)

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: Westinghouse PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	Converter	12BE6	12BE6	7CH	
V2	IF Amplifier	12BA6	12BA6	7BK	
V3	Det.-AVC-AF Amp	12AV6	12AV6	7BT	
V4	Audio Output	50L6GT	50L6GT	7S	
V5	Rectifier	35Z5GT	35Z5GT	6AD	

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: Westinghouse PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	
C1A	80	150	V-15527-1						
B	60	150							
C	20	25							
C2	.05	200	RCP10M4503M	DF-503		PT415	IMP2-S5	330215	Note 1
C3	10000		V-9863-3	DD-103	811-01	DC-511	IMP6-S1	330611	
C4	150		R4CC21YY151M	D6-151	GP2K-151	UC-5315		K-1350	
C5	5000		R2CC62Z5Z502P	DD-502	811-005	DC-525	IMP6-D5	330625	
C6	10000		V-9863-3	DD-103	811-01	DC-511	IMP6-S1	330611	
C7	10000		V-9863-3	DD-103	811-01	DC-511	IMP6-S1	330611	
C8	1000		R2CC61Z5Z102P	DD-102	811-102	DC-521	IMP6-D1	K-1210	
C9	.047	400	V-10157-4473M	DF-503		PT4147	IMP4-S47	3304147	
C10	.05	400	RCP10M4503M	DF-503		PT415	IMP4-S5	330415	
C11	.05	400	RCP10M4503M	DF-503		PT415	IMP4-S5	330415	

Note 1. Some versions may use a .01MFD capacitor (part #V-9863-3) in this application.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA: Westinghouse PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	V-12954-2	*QJ-617R		F1-52	UF16A	Tone - Panel
B	500KΩ	½				R2-47	UR55-T54	Volume - tapped @ 40KΩ-rear
C	Switch					KB-1	US-26	Attach to R1B

* CONCENTRIKIT EQUIVALENT: K-5 KIT, BASE ELEMENTS & SHAFTS: B13-137 & P1-020 (Panel)
B18-133X & R1-100 (Rear)
76-1 SWITCH

RESISTORS

ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA: Westinghouse PART No.	IRC PART No.	NOTES
R2	22KΩ	½	RC20AE223M	BTS-22K	
R3	68Ω	½	RC20AE680M	BTS-68	
R4	47KΩ	½	RC20AE473K	BTS-47K	
R5	3.3Meg	½	RC20AE335M	BTS-3.3Meg	
R6	22KΩ	½	RC20AE223M	BTS-22K	

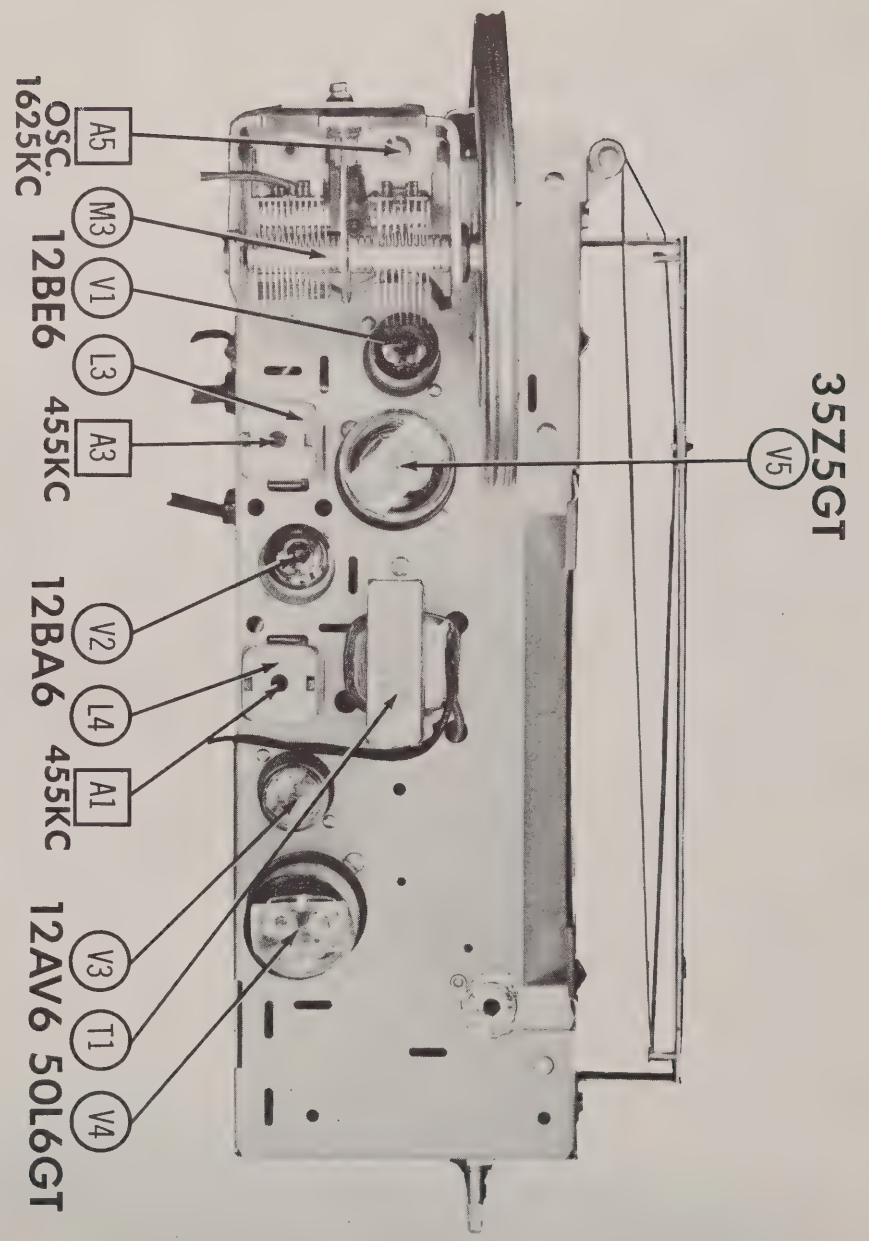
ITEM No.	RATING OHMS	RATING WATT	REPLACEMENT DATA: Westinghouse PART No.	IRC PART No.	NOTES
R7	6.8Meg	½		BTS-6.8Meg	Note 1
R8	270KΩ 5%	½	RC20AE274K	BTS-270K 5%	
R9	470KΩ	½	RC20AE474M	BTS-470K	
R10	100Ω	1	RC30AE101M	BTA-100	
R11	1000Ω	1	RC30AE102K	BTA-1000	

Note 1. Some versions use a 4.7Meg resistor in this application.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA: Westinghouse PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	2KΩ	3.7Ω	V-15530-1	Z1102 ①	A-2928	A-3876	22S45	S-1X	① Tape primary tap.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

SPEAKER

ITEM No.	RATINGS			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	Westinghouse PART No.	QUAM PART No.	
SP1	6"	PM	3.7Ω	V-15599-1 V-15599 ①	6A1	① Alternate PM speaker

COILS (RF-IF)

ITEM No.	USE	DC RES.		REPLACEMENT DATA				NOTES
		PRI.	SEC.	Westinghouse PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	
L1	Loop Ant.	3.1Ω		V-15233-1				Includes cabinet back
L2	Osc. Coil	1Ω	11.5Ω	V-14408-2	14-1073 *		69-OSC ■	Includes R2
L3	Input IF	15Ω	15Ω	V-10945-1	16-6758	BC-352	12-C1	
L4	Output IF	14Ω	14Ω	V-10350-1	16-6770	BC-355	12-C6	

* Leads sufficient mounting support.
■ Drill mounting hole.

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	Westinghouse PART No.	ASTATIC PART No.		ELECTRO-VOICE PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1		ACD-J	A-1 or A-3	46-T	0-1 or S-1 & 0-3	

ASTATIC AND ELECTRO-VOICE NEEDLE LISTINGS SHOWN ABOVE ARE SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGES LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

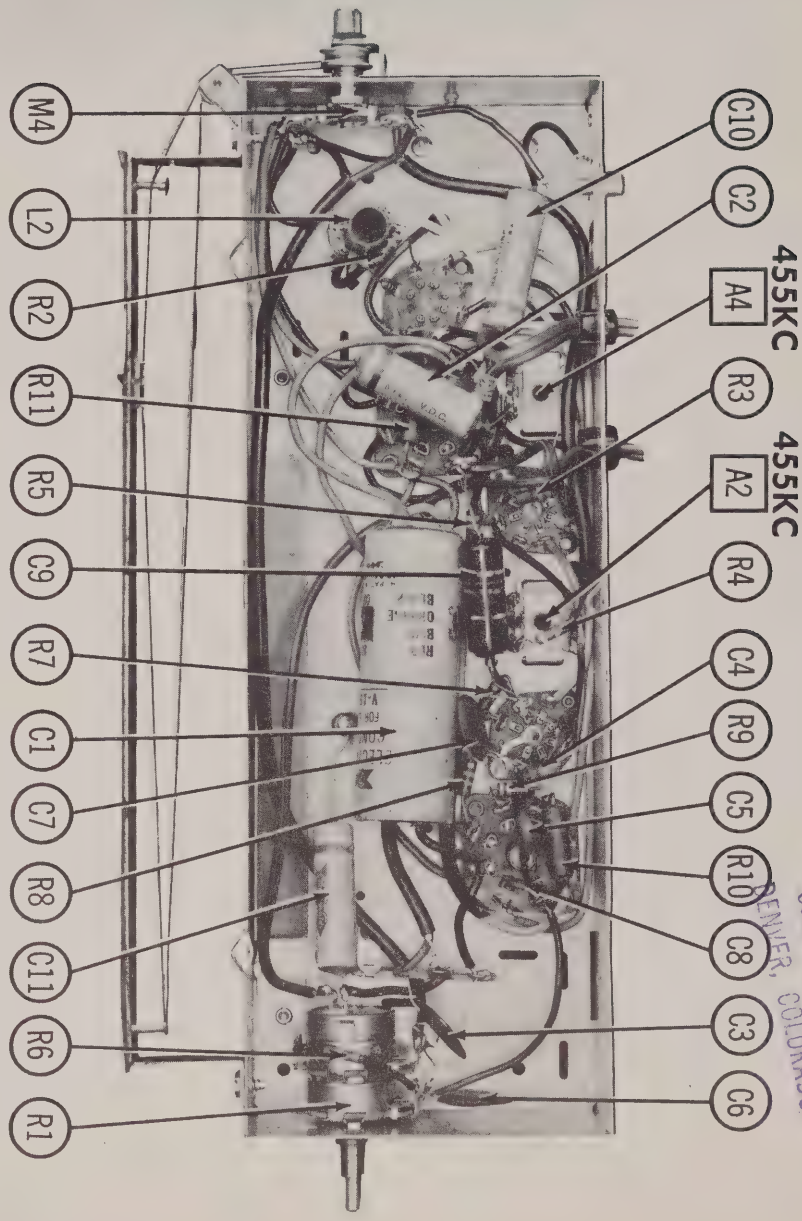
(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA				REMARKS
	Westinghouse PART No.	JENSEN PART No.	PERMO PART No.	WALCO PART No.	
M2		*JP-30LP or †JPS-30LP or ♦JPS-30LPD & *JP-30 or †JPS-30 or ♦JPS-30D	*A-322 or †A-300 or ♦A-300D & *C-320 or †C-318 or ♦C-318D	*W-30MGA or †W-30MGS or ♦W-30MGD & *W-30A or †W-30S or ♦W-30D	* Metal † Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	Westinghouse PART No.	NOTES
M3	Tuning Cap.	V-15186-1	2 Gang (10-370MMF, 15-110MMF)
M4	Switch	V-15608	Radio-Phono (Rotary - wafer type)
	Trimmer Cap.	V-15636-1	Ant. Trimmer (2-25MMF)
	Cabinet	V-1392-1	
	Handle	V-15489-1	Cabinet
	Knob	V-14499-2	Tone
	Knob	V-14500-2	Tuning
	Knob	V-14498-2	On-off -volume & Radio - phono switch
	Dial	V-14495-1	
	Dial Pointer	V-15211-1	
	Dial Background	V-14751-3	

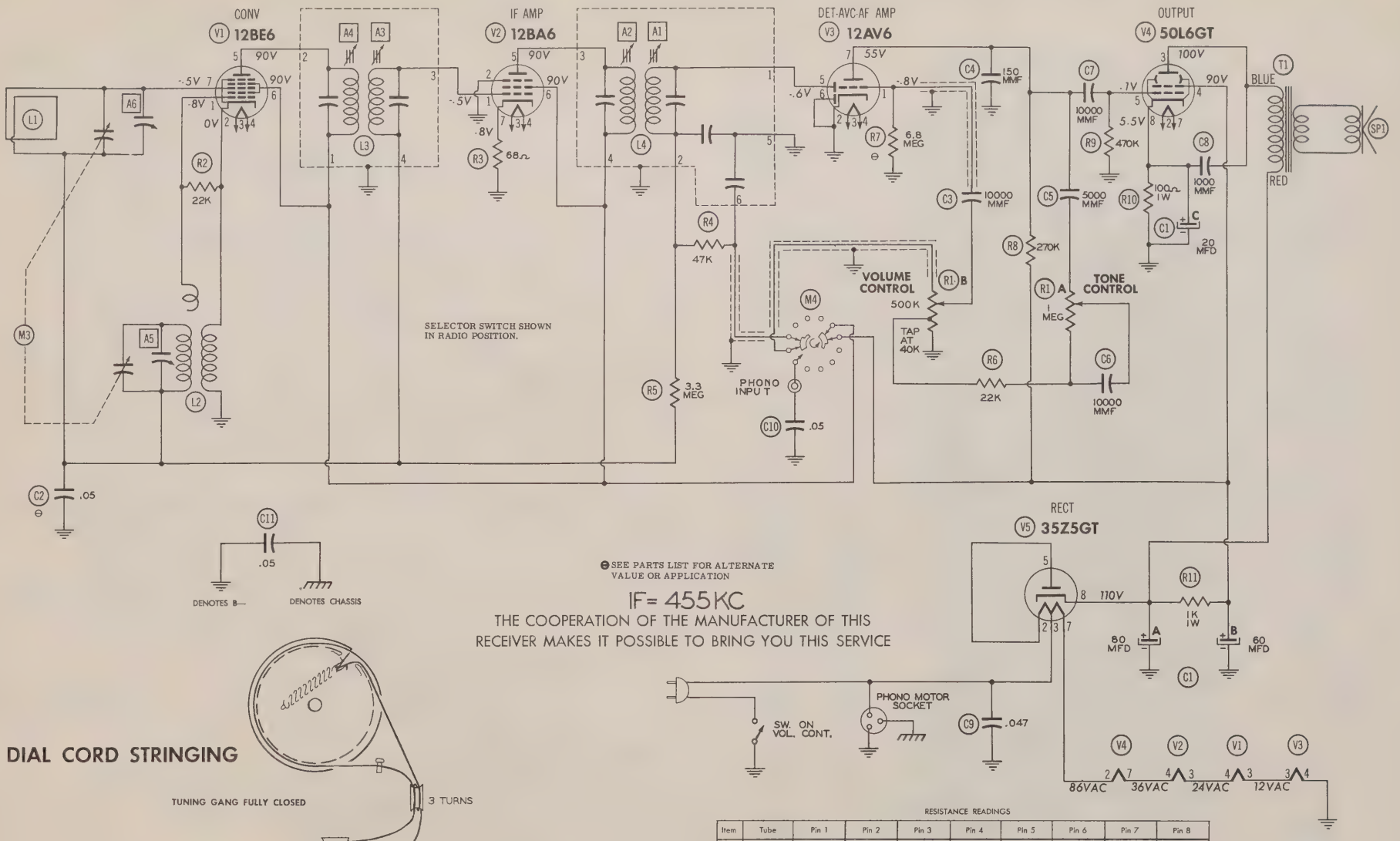
CHASSIS—BOTTOM VIEW



L. F. ELARTON
3924 MEADE ST.
DENVER, COLORADO

WESTINGHOUSE
MODEL H-482PR5 (Ch. V-2229-5)

WESTINGHOUSE
MODEL H-482PR5 (Ch. V-2229-5)

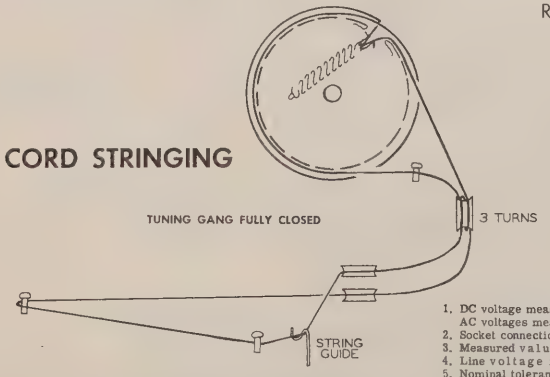


⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

IF = 455KC

THE COOPERATION OF THE MANUFACTURER OF THIS RECEIVER MAKES IT POSSIBLE TO BRING YOU THIS SERVICE

DIAL CORD STRINGING



1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ± 15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8
V 1	12BE6	22KΩ	1.5Ω	12Ω	24Ω	†1KΩ	†1KΩ	3.3Meg	
V 2	12BA6	3.3Meg	0Ω	24Ω	36Ω	†1KΩ	†1KΩ	68Ω	
V 3	12AV6	6.8Meg	0Ω	12Ω	0Ω	400KΩ	0Ω	†270KΩ	
V 4	50L6GT	TP	86Ω	†220Ω	†1KΩ	470KΩ	TP	36Ω	100Ω
V 5	35Z5GT	TP	121Ω	110Ω	TP	121Ω	TP	86Ω	80KΩ

† MEASURED RROM PIN 8 OF V5
TP - TIE POINT

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MODEL T2222B

ZENITH MODELS T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U)

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ZENITH MODELS T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U)

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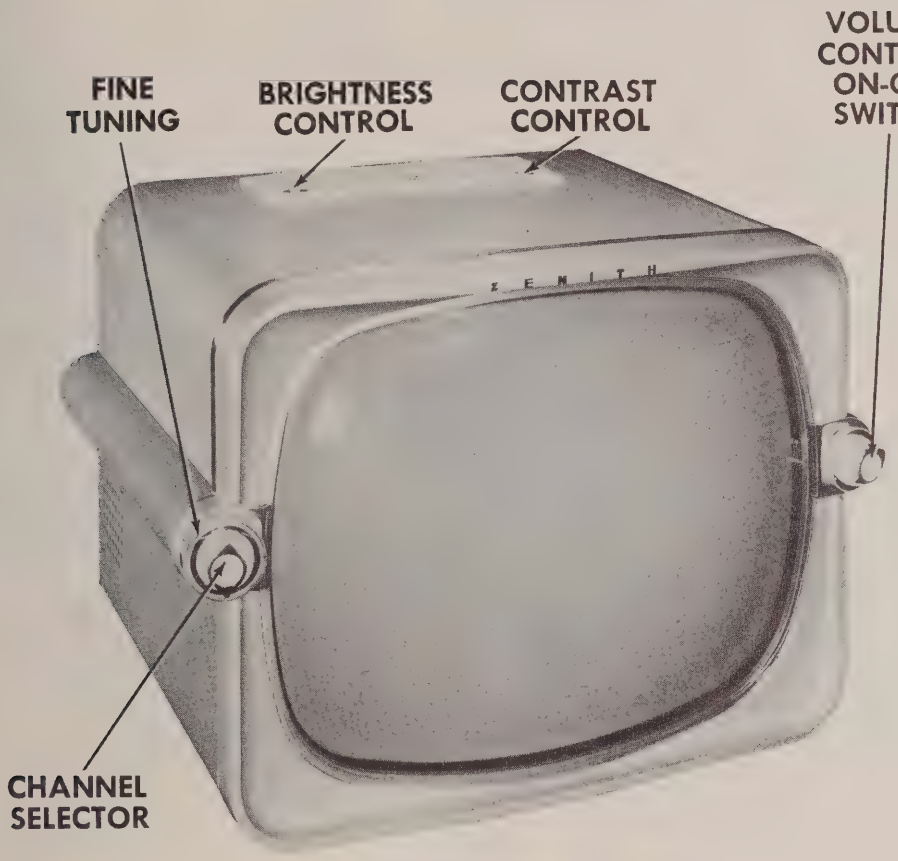

ZENITH MODEL T2222B

TRADE NAME	Zenith Models T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U)
MANUFACTURER	Zenith Radio Corp., 6001 Dickens Ave., Chicago 39, Illinois
TYPE SET	Television Receiver
TUBES	Seventeen
POWER SUPPLY	110-120 Volts AC-60 Cycles RATING 1.44 Amp. @ 117 Volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)

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ZENITH MODELS T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U)

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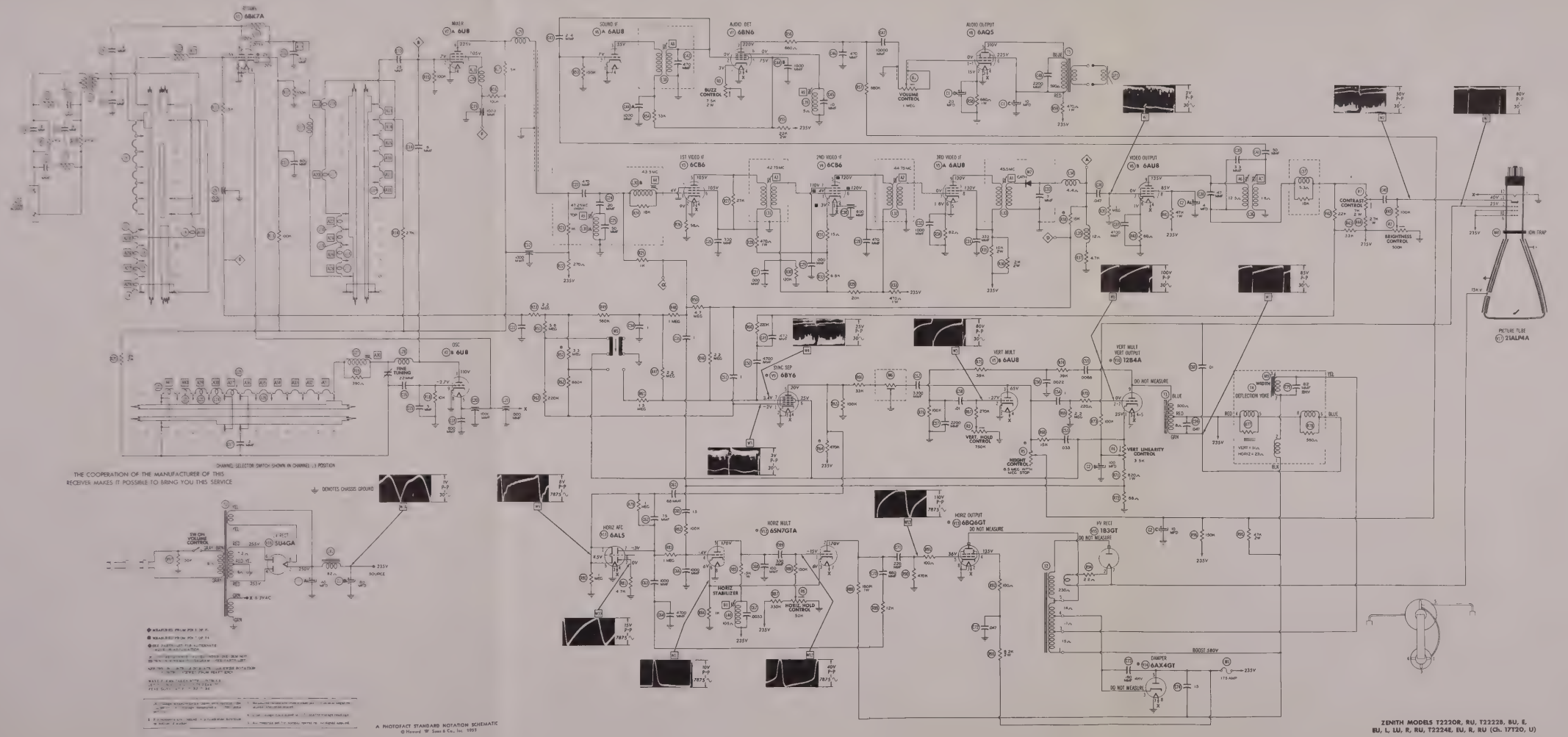

ZENITH MODELS T2220R, RU, T2222B, BU, E,
EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17720, U)

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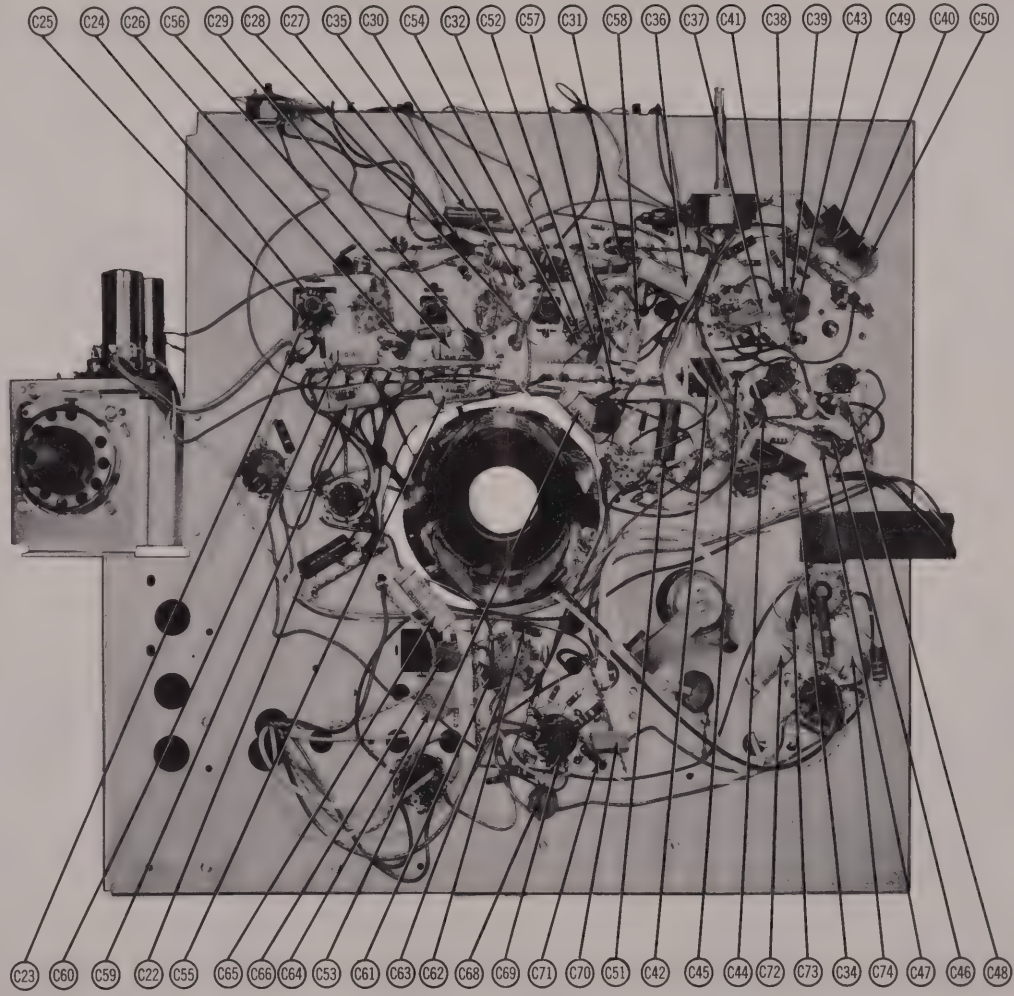
CHASSIS TOP VIEW

ZENITH MODELS T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U)



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION

TUBE PLACEMENT CHART

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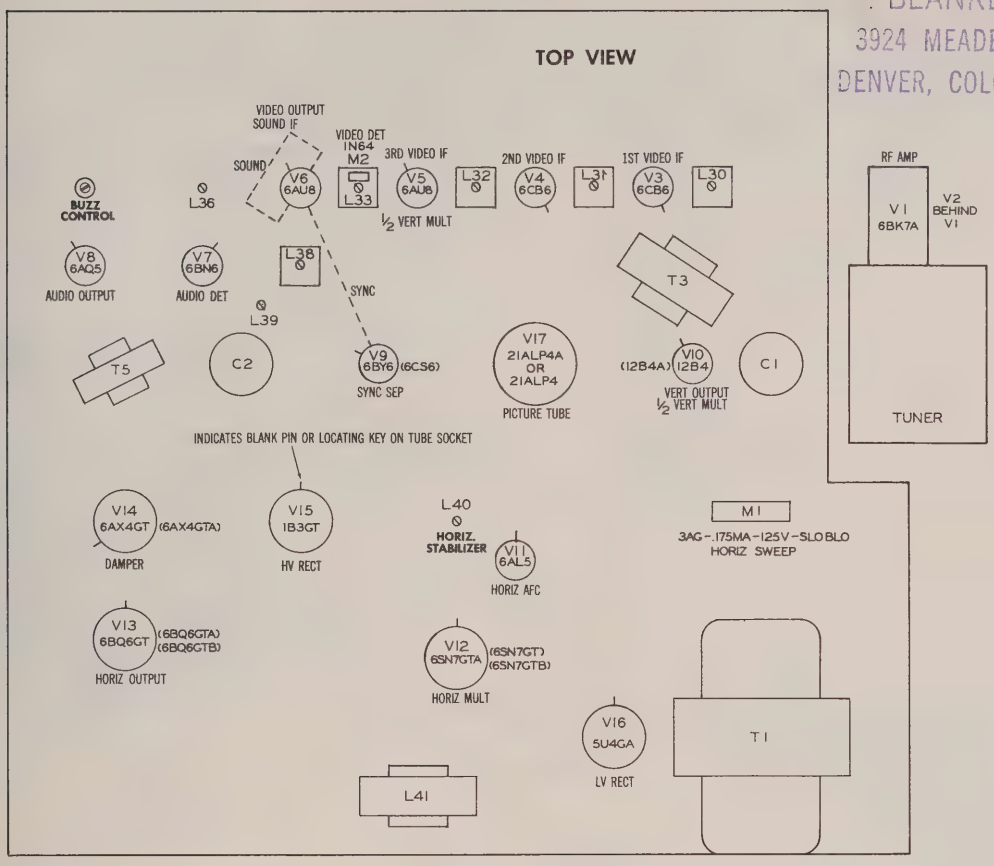


TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce the indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound - V16

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster - V2, V3, V4, V5, V6
No pic, no sound, has snow - V1, V2, V3
No pic, has sound, has raster - V6, V7
Has pic, no sound - V6, V7, V8
Overloaded picture -

SYNC FAILURE
No vert. sync - V5, V9, V10
No horiz. sync - V9, V11, V12
No vert. or horiz. sync - V9

SWEEP FAILURE
No raster, has sound - V12, V13, V14, V15, V17, Fuse (M1)
No vertical deflection - V5, V10
Poor vert. linearity or foldover - V5, V10
Poor horiz. linearity or foldover - V12, V13, V14
Narrow picture - V12, V13, V14, V15, V16
Vert. off freq. - V5, V9, V10
Horiz. off freq. - V9, V11, V12

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

The high voltage lead should be securely taped and kept away from chassis. Do not remove the horizontal multivibrator (V12) tube to disable the high voltage.

VIDEO IF ALIGNMENT

Remove the converter tube (V2) from its socket and connect a wire to pin 9. Replace V2 in its socket and connect a clip lead from loose end of wire to chassis.
Connect the negative lead of a 5 volt bias supply to point Ⓒ. Connect positive lead to chassis. Connect a clip lead from point Ⓓ to chassis. In step 6 attenuate sweep generator output to maintain not more than 3 volts peak to peak on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	470MMF	High side to point Ⓑ. Low side to chassis.	Not used	45.5MC (Unmod)	Any	Use VTVM. DC probe thru 10KΩ to point Ⓐ. Common to chassis.	A1	Attenuate generator output to maintain not more than -2 volts at VTVM. Adjust for maximum deflection.
2.	"	"	"	44.75MC	"	"	A2	"
3.	"	"	"	42.75MC	"	"	A3	"
4.	"	"	"	43.5MC	"	"	A4	"
5.	"	"	"	47.25MC	"	"	A5	Increase generator output for useable reading on VTVM. Adjust for MINIMUM deflection. Repeat steps 1 thru 4.
6.	"	"	43MC (10MC Swp)	41.25MC 42.75MC 45.0MC 45.75MC 47.25MC	"	Vert. Amp. thru 10KΩ to point Ⓐ. Common to chassis.		Check for response similar to Fig. 1. If necessary retouch A1 thru A5 to obtain desired response. Adjust A4 for maximum amplitude of response curve and position of 45.75MC marker. Adjust A3 for correct position of 42.75MC marker. Adjust A1 and A2 for correct band width. Increase sweep output and check position of 47.25MC trap. If necessary, SLIGHTLY retouch A5 for correct position of 47.25MC marker. The 41.25MC marker should be in proper position on response curve after correct bandpass and other marker positions are obtained. Remove wire from pin 9 of V2. Disconnect the bias supply and clip lead from point Ⓓ.

SOUND IF ALIGNMENT

Connect an attenuator (Zenith part #S-17203 or equivalent) in series with the receiver antenna.
Tune in a tone modulated TV signal and adjust the attenuator until the signal falls below the limiting level of the 6BN6 limiter detector, as evidence by a hiss similar to super-regeneration.
Adjust the sound take-off transformer (A6 and A7), the sound IF transformer (A8) and the quadrature coil (A9) for maximum sound of best quality.
Adjust the buzz control (R8) for minimum intercarrier buzz.
If during alignment of the Sound IF the signal rises above the limiting level of the 6BN6 (hiss disappears) increase the attenuation until hiss returns.

VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a 2 volt bias supply to point Ⓔ on tuner.
Connect the positive lead to chassis.
Set the RF trimmer (A10) at its center adjustment position. A10 should not require further adjustment unless the RF tube (V1) is replaced.
Preset A37 at its center adjustment position. In step 14 adjustment of A21 is not necessary if proper bandpass is obtainable by adjusting A20.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
7.	Fig. 2	Across antenna terminals wthru matching network (Fig. 2).	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point Ⓕ. Low side to chassis.	A11, A12	Check for response curve as in Fig. 3. If necessary, adjust A11 by expanding or compressing coil turns for proper band width. Adjust A12 by expanding or compressing coil turns for maximum amplitude of response curve.
8.	"	"	207MC (10MC Swp)	205.25MC 209.75MC	12	"	A13	Check for response curve similar to Fig.3. If necessary adjust by bending loop in or out from switch rotor for proper response.
9.	"	"	201MC (10MC Swp)	199.25MC 203.75MC	11	"	A14	"
10.	"	"	195MC (10MC Swp)	193.25MC 197.75MC	10	"	A15	"
11.	"	"	189MC (10MC Swp)	187.25MC 191.75MC	9	"	A16	"
12.	"	"	183MC (10MC Swp)	181.25MC 185.75MC	8	"	A17	"
13.	"	"	177MC (10MC Swp)	175.25MC 179.75MC	7	"	A18	"
14.	"	"	85MC (10MC Swp)	83.25MC 87.75MC	6	"	A19,A20, A21	Adjust A20 and A21 for correct bandpass. Adjust A19 for maximum amplitude similar to Fig. 3. A19, A20 and A21 are adjusted by expanding or compressing coil turns.
15.	"	"	79MC (10MC Swp)	77.25MC 81.75MC	5	Vert. Amp. thru 10KΩ to point Ⓕ. Low side to chassis.	A22,A23	Adjust by expanding or compressing coil turns for response curve similar to Fig.3.
16.	"	"	69MC (10MC Swp)	67.25MC 71.75MC	4	"	A24,A25	"
17.	"	"	63MC (10MC Swp)	61.25MC 65.75MC	3	"	A26,A27	"
18.	"	"	57MC (10MC Swp)	55.25MC 59.75MC	2	"	A28,A29	"

ALIGNMENT INSTRUCTIONS (cont)

VHF OSCILLATOR ALIGNMENT

Connect bias as under "Video IF Alignment".
Set the fine tuning control to the position where the brass flat shaft is in a horizontal position. Leave it at this mid-range position during entire oscillator alignment.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
19.	Fig. 2	Across antenna terminals thru matching network (Fig. 2).	213MC (10MC Swp)	211.25MC 215.75MC	13	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A30	Adjust to place video marker at 50% on response curve as shown in Fig. 4. Sound marker should be at 5%.
			207MC (10MC Swp)	205.25MC 209.75MC	12		A31	
			201MC (10MC Swp)	199.25MC 203.75MC	11		A32	
			195MC (10MC Swp)	193.25MC 197.75MC	10		A33	
			189MC (10MC Swp)	187.25MC 191.75MC	9		A34	
			183MC (10MC Swp)	181.25MC 185.75MC	8		A35	
			177MC (10MC Swp)	175.25MC 179.75MC	7		A36	
			85MC (10MC Swp)	83.25MC 87.75MC	6		A37	
			79MC (10MC Swp)	77.25MC 81.75MC	5		A38	
			69MC (10MC Swp)	67.25MC 71.75MC	4		A39	
			63MC (10MC Swp)	61.25MC 65.75MC	3		A40	
			57MC (10MC Swp)	55.25MC 59.75MC	2		A41	

UHF TUNER ALIGNMENT

Alignment of the UHF tuner should not be attempted unless proper test equipment is available.
Switch the receiver to UHF position.
Connect the negative lead of a 2 volt bias supply to point Ⓒ. Connect positive lead to chassis.
Adjust the sweep generator output to provide 3 volts peak to peak on scope.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
20.	Fig. 5	Across VHF antenna terminals thru matching network (Fig. 5).	713MC (10MC Swp)	711.25MC	54	Vert. Amp. thru 10KΩ to point Ⓐ. Low side to chassis.	A42, A43, A44	Tuner rocker arm should be in the horizontal position. If necessary, loosen set screw and adjust tuner so that rocker arm is horizontal when the channel indicator is set to channel 54. Do not adjust A42 unless oscillator calibration is off more than 3 channels. If necessary, adjust A42 to place video marker at 50% on response curve as in Fig. 4. The image (weaker response) will appear also. The response toward the counter clockwise position of A42 is the proper response. Adjust A43 and A44 for maximum amplitude of response similar to Fig. 4.
21.	"	"	473MC (10MC Swp)	471.25MC	14	"		Check for response similar to Fig. 4. If oscillator is off more than 3 channels, adjust the oscillator travel (osc., mixer and antenna travel adjustments are the three round thumb screws on top of tuner) adjustment to scale. Care must be used in making this adjustment so as not to move the rocker arm out of its bearing. Set the mixer and antenna travel adjustments for maximum response on scope.
22.	"	"	887MC (10MC Swp)	885.25MC	83	"	A45, A46, A47	Adjust A45 to place marker at 50% as in Fig. 4. Adjust A46 and A47 for maximum amplitude and symmetry of response similar to Fig. 4.

UHF IF INTERSTAGE AND INPUT COIL ADJUSTMENTS

Tune in a local TV station operating on a UHF frequency. Adjust A48 and A49 for best noise free picture.

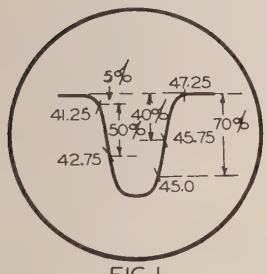
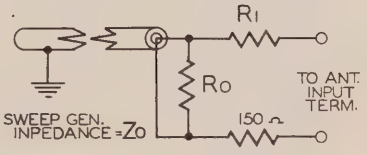


FIG. 1



ZO	RO	R1
50Ω	50Ω	120Ω
72Ω	82Ω	110Ω
92Ω	110Ω	100Ω

FIG. 2

FIG. 3

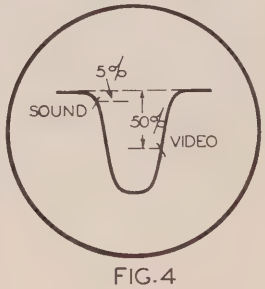


FIG. 4

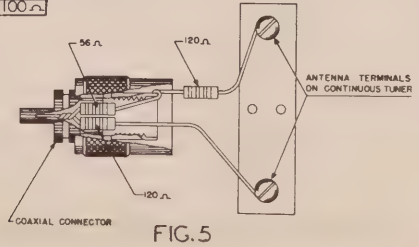


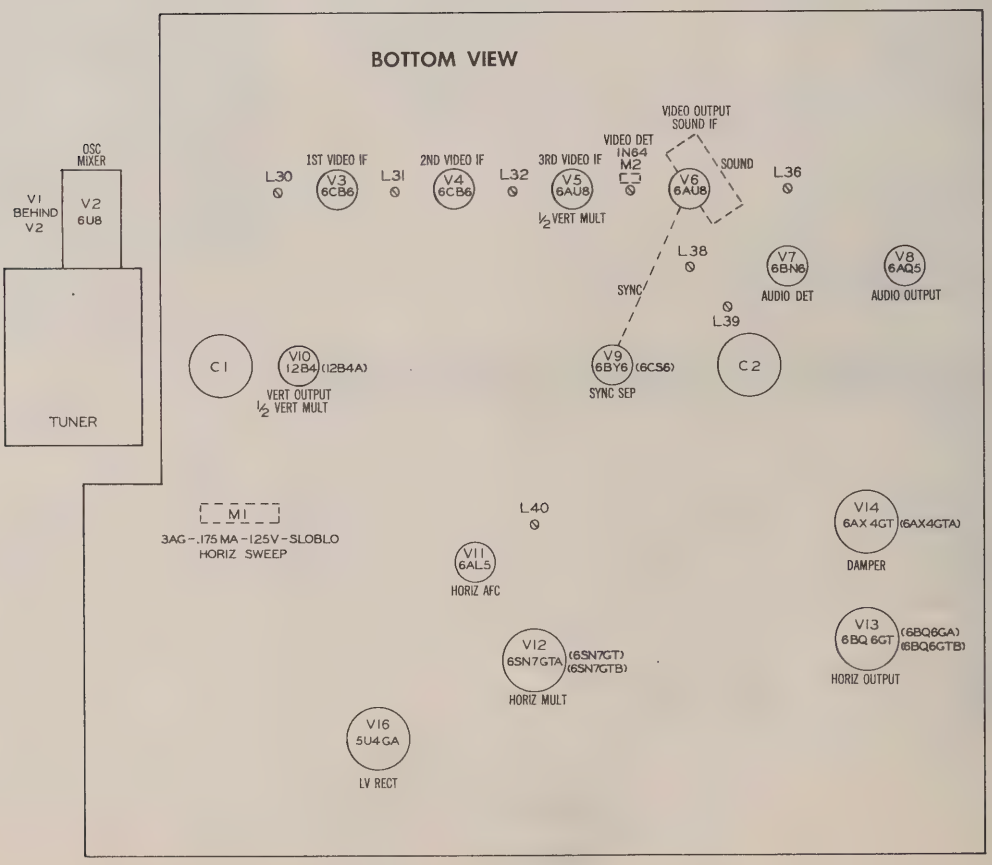
FIG. 5

ZENITH MODELS T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U)

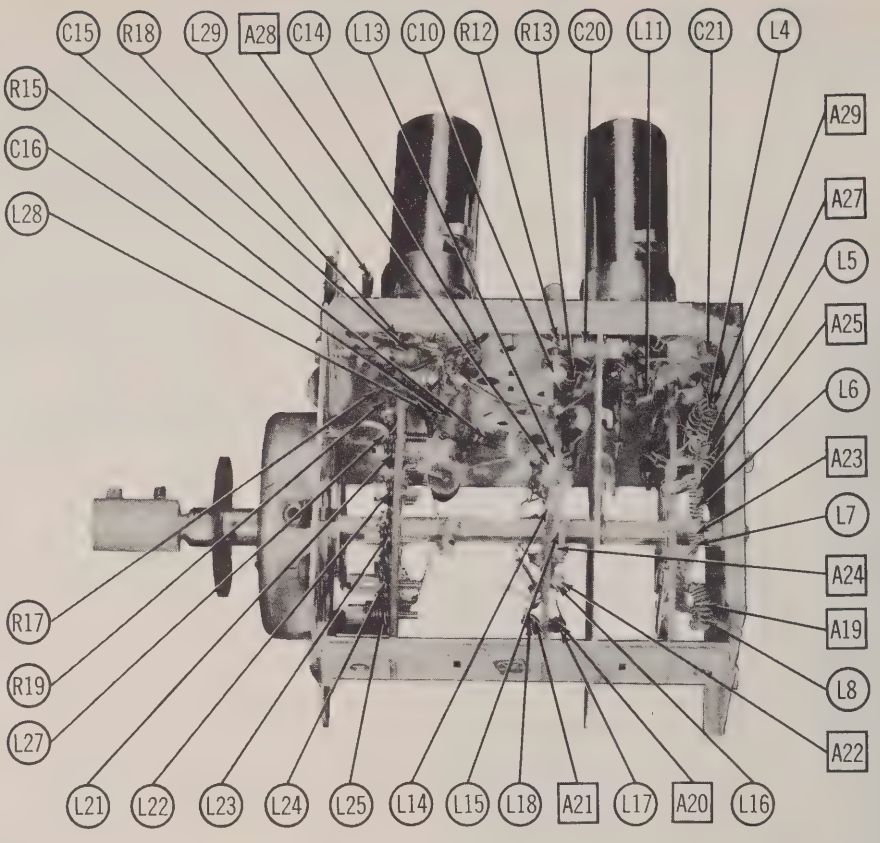
RESISTANCE MEASUREMENTS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	6BK7A	†3KΩ	70KΩ	INF	.1Ω	0Ω	INF	3.5Meg	0Ω	0Ω
V 2	6U8	†12KΩ	100KΩ	†100KΩ	0Ω	.1Ω	†1.3KΩ	0Ω	0Ω	10KΩ
V 3	6CB6	1.8Meg	56Ω	0Ω	.1Ω	▲500Ω	▲500Ω	0Ω		
V 4	6CB6	85KΩ	▲15Ω	0Ω	.1Ω	†550Ω	†550Ω	85KΩ		
V 5	6AU8	0Ω	600KΩ	▲3.5Meg	0Ω	.1Ω	82Ω	.1Ω	†6KΩ	†6KΩ
V 6	6AU8	0Ω	100KΩ	†55KΩ	0Ω	.1Ω	68Ω	1Meg	†47KΩ	†8.5KΩ
V 7	6BN6	450Ω	.4Ω	0Ω	.1Ω	†22KΩ	5Ω	▲70uKΩ		
V 8	6AQ5	350KΩ	680Ω	0Ω	.1Ω	†1.1KΩ	†500Ω	350KΩ		
V 9	6BY6	230KΩ	0Ω	0Ω	.1Ω	†130KΩ	1.4KΩ	1.5Meg		
V 10	12B4A	1.4KΩ	2.2Meg	0Ω	.1Ω	.1Ω	TP	2.2Meg	TP	†550Ω
V 11	6AL5	1Meg	4.7KΩ	0Ω	.1Ω	1Meg	NC	2Meg		
V 12	6SN7GTA	180KΩ	▲220KΩ	1KΩ	3Meg	†15KΩ	1KΩ	.1Ω	0Ω	
V 13	6BQ6GT	TP	.1Ω	TP	†8.2KΩ	470KΩ	TP	0Ω	0Ω	TOP CAP ▲14Ω
V 14	6AX4GT	TP	NC	200KΩ	NC	†62Ω	NC	0Ω	.1Ω	
V 15	1B3GT		PIN8	1 - 8	HAVE	INF	RESISTANCE			TOP CAP ▲244Ω
V 16	5U4GA	NC	60KΩ	TP	19Ω	NC	17Ω	TP	60KΩ	
V 17	21ALP4A	0Ω	100KΩ	PIN 6 †62Ω	PIN 10 †62Ω	PIN 11 †200KΩ	PIN 12 .1Ω			

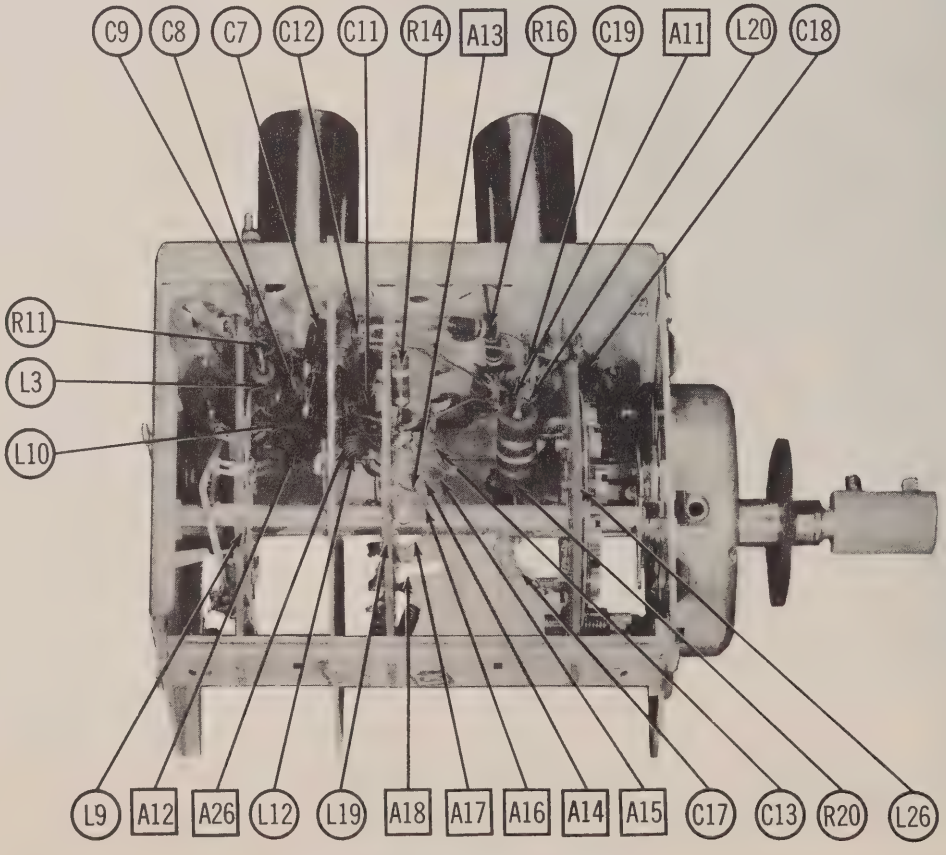
† MEASURED FROM PIN 2 OF V16
▲ MEASURED FROM PIN 7 OF V4
▲ MEASURED FROM PIN 3 OF V14
TP - TIE POINT
NC - NO CONNECTION



TUBE PLACEMENT CHART



RF TUNER-RIGHT SIDE



RF TUNER-LEFT SIDE

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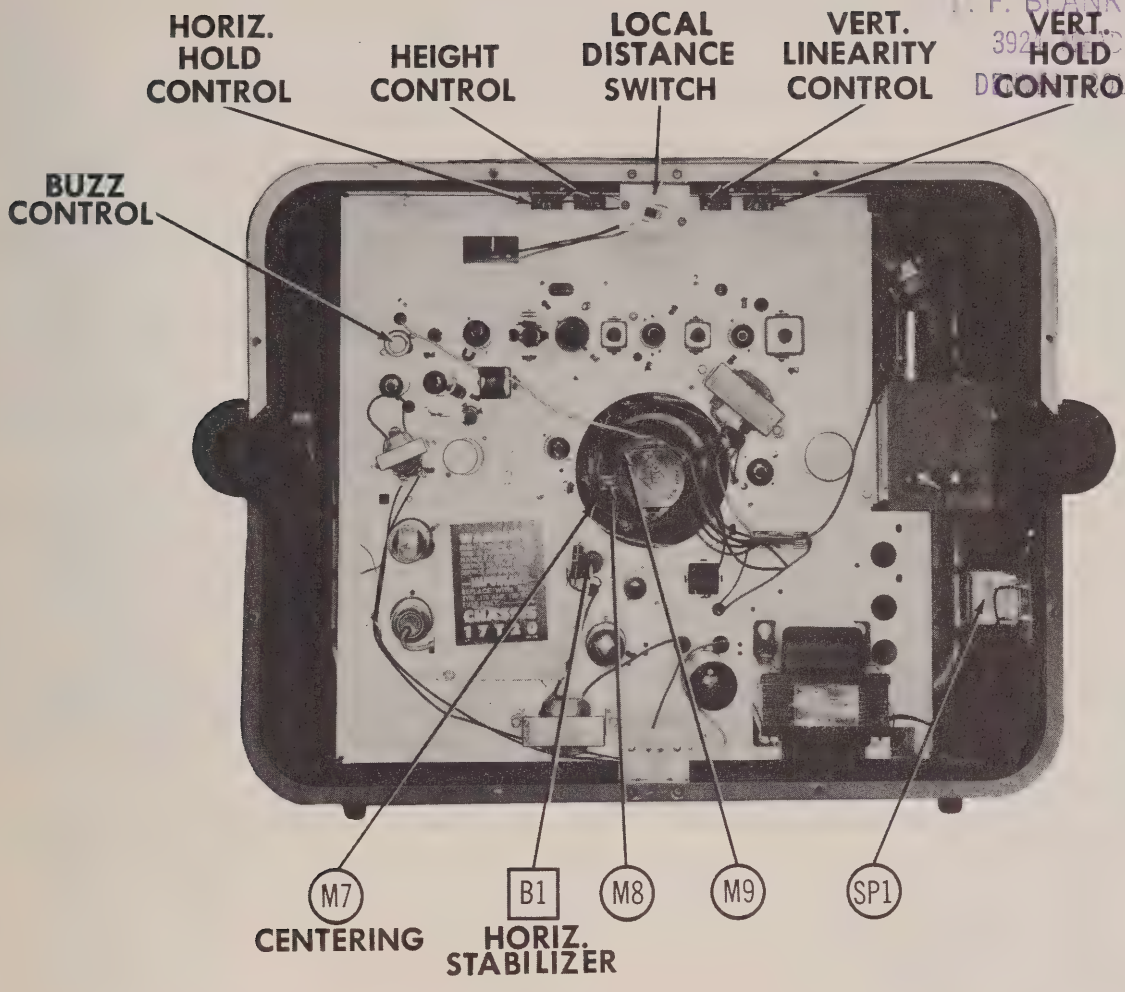
DE[illegible]ORADO



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

1. Turn the set on and tune in a TV station, preferably a test pattern.
2. Connect a .5MFD capacitor from the junction of C67, R85 and L40 and chassis.
3. Set the horizontal hold control until the picture synchronizes horizontally, picture may not hold steady.
4. Remove the .5MFD capacitor from junction of C67, R85 and L40 and chassis.
5. Adjust the horizontal stabilizer slug (B1) until picture again locks into horizontal sync without readjusting the horizontal hold control.

TROUBLE SHOOTING AIDS

SWEEP

HORIZONTAL

LOSS OF SWEEP

Follow procedure outlined under "Loss of High Voltage".

INSUFFICIENT SWEEP

Check by substitution V13, V14 and V16. Check C70, C71, R89, R88, R93, T2, T4A and other associated components.

DRIVE LINES

Check by substitution V13 and V14. Check T2, T4A, R89, R93, C70, C71 and other associated components.

COMPRESSED LEFT SIDE

Check by substitution V13 and V14. Check horizontal output and damper stages for component failure or change of value.

FOLDS

Follow procedure outlined under "Drive Lines".

PIE CRUST EFFECT

Check by substitution V12, V13 and V14. Check C66 for open. Check L40, C67, C69, R85 and other associated components.

XMAS TREE EFFECT

Check by substitution V12, V13 and V14. Check T2 and T4 for internal arcing. Check C64, C63, C62, C67, L40, R83, R80 and other associated components.

VERTICAL

LOSS OF SWEEP

Check by substitution V5 and V10. Check waveform W6.

If Satisfactory	If Unsatisfactory
Check T3, T4B, R71, R72 and other associated components.	Check R5, R95, R67, C52, C54, C55 and other associated components.

INSUFFICIENT SWEEP

Check by substitution V5 and V10. Check vertical size and vertical linearity controls for proper operation. Check T3, R95 and other associated components.

COMPRESSED AT BOTTOM

Check by substitution V5 and V10. Check C54, C58, C56, R95, R5 and other associated components.

COMPRESSED AT TOP

Check by substitution V5 and V10. Check C2B, R4, R71, R72, T3 and other associated components.

FOLDS

Check by substitution V5 and V10. Check C53, C54, R68, R75 and other associated components.

SYNC

LOSS OF VERTICAL AND HORIZONTAL SYNC

Substitute V9. Check C49, C50, C51, R64, R65 and other associated components.

LOSS OF VERTICAL SYNC - HORIZONTAL SYNC SATISFACTORY

Substitute V5. Check vertical integrator network. Check R67, R3 and other associated components.

LOSS OF HORIZONTAL SYNC - VERTICAL SYNC SATISFACTORY

Check by substitution V11 and V12. Check C61, C62, C65, L40, R85, R81 and other associated components.

HORIZONTAL BENDING

Check by substitution V9, V11 and V12. Check horizontal AFC network.

VIDEO

LOSS OF VIDEO

Substitute V6. Check R44, R41, R40, C36, C38, C40 and other associated components.

SOUND BARS (4.5MC BEAT)

Adjust tuner fine tuning for best sound and picture. Check adjustment A6. Check video IF alignment.

POOR CONTRAST

Substitute V6. Check C36, C40, L37, R44 and other associated components.

NEGATIVE PICTURE

Substitute V6. Check picture tube. Check C36, C40 and other associated components.

SMEAR

Substitute V6. Check video crystal detector network. Check C36, C40, L37, L34, L35 and other associated components.

WIDE BLACK BAR ACROSS PICTURE

Check by substitution V1, V3, V4, V5 and V6 for heater to cathode leakage.

AUDIO

WEAK OR NO SOUND

Check by substitution V6, V7 and V8. Check stage V8 using audio signal generator. Apply audio signal across R1.

If Satisfactory	If Unsatisfactory
Check audio detector and audio IF stages for component failure or change of value.	Check C45, C46, C47, C48, R55, R57, R58, R59, T5, speaker and other associated components.

BUZZ

Adjust tuner fine tuning for best sound and picture. Check adjustments A9 and R8 for minimum buzz. Check audio IF alignment.

DISTORTED

Follow procedure outlined under "Weak or No Sound".

POWER

DEAD SET

If filaments fail to light, check AC interlock assembly. Check switch on volume control and T1. If filaments light, substitute V16. Check B+ filter and decoupling network.

SMALL AND/OR DIM PICTURE

Substitute V16. Check B+ filter and decoupling network.

PROPERTY OF
L. F. BLANKENSHIP
3321 MEADE ST.
DENVER, COLORADO

ZENITH MODELS T2220R, RU, T2222B, BU, E, EU, L, LU, R, RU, T2224E, EU, R, RU (Ch. 17T20, U)

ALTERNATE TUNER SCHEMATIC

MIXER A 6U8
RF AMP 6BK7A
OSC B 6U8
UHF OSC 6AF4
CHANNEL SELECTOR SWITCH SHOWN IN CHANNEL 13 POSITION
FINE TUNING
UHF - VHF TUNER S22788 USED WITH CHASSIS 17T20U
CHANNEL BRACKET
UHF - VHF ANT. TERM. BOARD
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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PARTS LIST AND DESCRIPTIONS

TUBES (SYLVANIA, GENERAL ELECTRIC, WESTINGHOUSE)

ITEM No.	USE	REPLACEMENT DATA: ZENITH PART No.	REPLACEMENT DATA: STANDARD REPLACEMENT	RETMA BASE TYPE	NOTES
V1	RF Amplifier	6BK7A	6BK7A	8AJ	
V2	Mixer - Osc.	6U8	6U8	8AK	
V3	1st. Video IF Amp.	6CB6	6CB6	7CM	
V4	2nd. Video IF Amp.	6CB6	6CB6	7CM	
V5	3rd. Video IF Amp. - Vert. Mult.	6AU8	6AU8	7DF	
V6	Video Output- Sound IF Amp.	6AU6	6AU8	7DF	
V7	Audio Detector	6BN6	6BN6	7CE	
V8	Audio Output	6AQ6	6AQ6	7BZ	
V9	Sync Sep.	6BY8	6BY8	7CH	6CS6 used as alternate
V10	Vert. Mult. - Vert. Output	12BA6	12BA6	9AG	12B4 used as alternate
V11	Horiz. AFC	6AL5	6AL5	8BT	
V12	Horiz. Mult.	6SN7GTA	6SN7GTA	8BD	6SN7GT and 6SN7GTB used as alternates
V13	Horiz. Output	6BQ6GT	6BQ6GT	8AM	6BQ6GA and 6BQ6GTB used as alternates
V14	Damper	6AX4GT	6AX4GT	4CG	6AX4GTA used as alternate
V15	HV Rectifier	1B3GT	1B3GT	3C	
V16	LV Rectifier	5U4GA	5U4GA	5T	

CATHODE-RAY TUBE

ITEM No.	REPLACEMENT DATA: ZENITH PART No.	CBS-HYTRON PART No.	GENERAL ELECTRIC PART No.	SYLVANIA PART No.	WESTINGHOUSE PART No.	RETMA BASE TYPE	NOTES
V17	21ALP4A ① 21ALP4	21ALP4A ① 21ALP4	21ALP4A ①	21ALP4A ② 21ALP4	21ALP4A ① 21ALP4	12L 12L	① Aluminized ② Silver screen

CAPACITORS

Capacity values given in the rating column are in mfd. for Electrolytic and Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ZENITH PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C1A	≠40	400	22-2547			FP385.5	TM-804020-	T-180	
B	≠80	400				TC26	450	FM-0535	
C	≠10	400					TP-25-35		
D	30	25							
C2A	4	350	22-2545			FP387.1	TM-3061	T-818	
B	100	50							
C	≠10	475							
C3	12		22-2679	TCZ-12	NP0X-120				
C4	18		22-2680	TCZ-18	NP0X-180				
C5	18		22-2680	TCZ-18	NP0X-180				
C6	12		22-2672	TCZ-12	NP0X-120				
C7	7.5		22-2672						
C8	1.5		22-2424	TCZ-1R5	NP0A-1R5	CZ-5315			
C9	1000		22-2677						
C10	.5-3		22-2453	539-3	311S-01-0R5	CZ565A			
C11	900		22-2331	DD-901	831-901				
C12	1000		22-2677						
C13	25		22-2671	TCN-25	NT50X-250				
C14	.8		22-2676						
C15	5		22-2675						
C16	23		22-2673	TCN-23	NT50X-230				
C17	3		22-2672						
C18	900		22-2331	DD-901	831-901	DC-531			
C19	1000		22-2677						
C20	1000		22-2677						
C21	1000		22-2677						
C22	.1	200	22-1777	DF-104		PT401	IMP2-P1	330201	
C23	470		22-6	DD-471	831-471	UC-5347		K-1347 , KR-1430	
C24	20		22-2581	TCZ-20	NP0X-200	UC-543		KH-1450	
C25	50		22-2654	TCZ-50	NP0-338-500	UC-545		KH-1450	
C26	330		22-2309	D6-331	GP2K-331	UC-5333		K-1333	
C27	1000		22-7	DD-102	801-001	DC-531		K-1210	
C28	470		22-2302	D6-471	GP2K-471	UC-5347		KH-1347	
C29	1000		22-7	DD-102	801-001	DC-531		K-1210	
C30	800		22-2677	MFT-1000	831-801	DC-531		K-1333	
C31	330	500	22-1645	D6-331	GP2K-331	UC-5333		K-1330	
C32	1000		22-7	DD-102	801-001	DC-531			
C33	T		22-2375						
C34	.1	200	22-1777	DF-104		PT401	IMP2-P1	330201	
C35	.1	200	22-1777	DF-104		PT401	IMP2-P1	330201	
C36	.047	200	22-1778	DF-503		PT4147	IMP2-S47	330147	
C37	4700		22-2634	DD-472	811-0047	UC-5347	IMP2-D47	C-1347	
C38	47		22-2467						
C39	3.3		22-2343	TCZ-3R3	NP0A-3R3	CZ-5533			
C40	.1	200	22-1777	DF-104		PT401	IMP2-P1	330201	
C41	50		22-2469	D6-500	GP2K-500	UC-545		K-1450	
C42	470	500	22-2480	D6-471	811-471	MCB245		KR-1347	
C43	2.4		22-2596						
C44A	1000		22-2545	DD2-102	812-001	DCD-521		K-1210	
B	1000							K-1210	
C45	10		22-2378						
C46	470		22-6	DD-471	831-471	UC-5347		K-1347	
C47	10000		22-3	DD-103	811-01	DC-511	IMP6-S1	330611	
C48	2200		22-8	DD-222	811-0022	UC-5222	IMP6-D22	C-1222	
C49	470		22-6	DD-471	831-471	UC-5347		K-1347	
C50	4700		22-2659	DD-472	811-0047	UC-5347	IMP6-D47	C-1347	
C51	.1	200	22-1777	DF-104		PT401	IMP2-P1	330201	
C52	3300		22-2378	DD-332	811-0033	UC-5333	IMP6-D33	C-1333	
C53	.033	400	22-2635			PT491	IMP4-P1	330491	
C54	.1	400	22-2061	DF-104		MCB469			
C55	.0068	600	22-2368			MCE466		CH-1222	
C56	.0022	600	22-1814			UC-5222	IMP6-D22	C-1222	
C57	2200		22-18	DD-223	811-0022				
C58	.01	300	22-2565						
C59	.047	200	22-1778	DF-503		PT4147	IMP2-S47	3302147	
C60	.01	600	22-1646	D6-103	GP2-333-103	PT431	IMP4-S1	330611	

CAPACITORS (cont)

ITEM No.	RATING: CAP.	RATING: VOLT	REPLACEMENT DATA: ZENITH PART No.	CENTRALAB PART No.	ERIE PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	NOTES
C61	68	500	22-2685	D6-680	801-680			K-1468	
C62	75		22-1748	D6-750	801-750	MC330		K-1475	
C63	1000		22-17	DD-102	801-001	DC-531	IMP6-D1	K-1210	
C64	4700		22-2634	DD-472	811-0047	UC-5347		C-1347	
C65	.15	200	22-2166	DD16-153		PT4015	IMP2-P15	3302015	
C66	1000		22-7	DD-102	801-001	DC-531	IMP6-D1	K-1210	
C67	3300	400	22-2664			MCB235		CH-1233	
C68	100		22-9	DD-101	801-101			KH-1310	
C69	330	500	22-2667	D6-331	811-331			KH-1333	
C70	680	500	22-2668	D6-681	811-681			KH-1368	
C71	230		22-2468	D6-231	GP2K-231	UC-5323		K-1323	
C72	.047	400	22-1775	DF-503		PT4147	IMP4-S47	3304147	
C73	180	4000	22-2693					K-4218	
C74	.15	400	22-2261	DD16-153		PT4015	IMP4-P15	330415	
C75	82	2000		DD30-820					

CONTROLS

ITEM No.	RATING: RESISTANCE	RATING: WATTS	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	CLAROSTAT PART No.	CENTRALAB PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1Meg	½	63-3273	QII-137	A47-1Meg-S	B-69-S	U-54	Volume
B	Shaft		Not Req.	Not Req.	FS-3	Not Req.	Not Req.	Attach to R1A
C	Switch		Not Req.	76-1	SWE-12	Not Req.	US-26	Attach to R1A
R2A	500KΩ	½	63-3264	QII-133		A3-61		Brightness
B	Shaft		Not Req.	Not Req.		AK-1		Attach to R2A
R3A	750KΩ	½	63-3263	QII-135	A47-750K-S	A3-66	TA-16L	Vert. Hold
B	Shaft		Not Req.	Not Req.	FKS-1/4	AK-1	Not Req.	Attach to R3A
R4A	3500Ω	½	63-3265	QII-114	A47-4000-S	A3-9	TA352A	Vert. Linearity
B	Shaft		Not Req.	SQ	FKS-1/4	AK-1	Not Req.	Attach to R4A
R5A	8.5Meg	½	63-3263	* QII-142	*A47-7.5Meg-	AB-89 *		Height (Stop ⑤ 1Meg)
B	Shaft		Not Req.	SQ	FKS-1/4 ②	AK-1		Attach to R5A
R6A	50KΩ	½	63-3261	QII-123	A47-50K-S	BK-31	TA346	Horiz. Hold
B	Shaft		Not Req.	Not Req.	FKS-1/4	Not Req.	Not Req.	Attach to R6A
R7A	7500Ω	2	63-3277	WK-7500	A43-7500		RT501L	Contrast (wire-wound)
B	Shaft		Not Req.	Not Req.	KBS-3		Not Req.	Attach to R7A
R8	750Ω	2	63-3284		39-S00			Buzz (wire-wound)

* Connect a 1Meg resistor in series with the right hand terminal of the control and the lead connecting to the same terminal of the original control (control viewed from shaft end, terminals down).

RESISTORS

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	NOTES
R9	470KΩ	½	63-1898	BTS-470K	
R10	470KΩ	½	63-1898	BTS-470K	
R11	15KΩ	½	63-1834		
R12	100KΩ	½	63-1859		
R13	100KΩ	½	63-1859	BTS-100K	
R14	3700Ω	½		BTS-3700	
R15	100KΩ	½	63-1859		
R16	100KΩ	½	63-1859		
R17	15KΩ	½	63-1834		
R18	10KΩ	½	63-1827		
R19	390Ω	½	63-1788	BTS-390	
R20	120KΩ	½	63-1861	BTS-120K	
R21	1000Ω	½	63-1785	BTS-1000	
R22	270Ω	½	63-1781	BTS-270	
R23	2.2Meg	½	63-1926	BTS-2.2Meg	
R24	18KΩ	½	63-1838		
R25	1000Ω	½	63-1785	BTS-1000	
R26	56Ω	½	63-1733	BTS-56	
R27	27KΩ	½	63-1845		
R28	470Ω	1		BTA-470	
R29	120KΩ	½	63-1873	BTS-120K	
R30	120KΩ	½	63-1873		
R31	15Ω	½	63-1708	BTS-15	
R32	6800Ω	½	63-1831		
R33	470Ω	1		BTA-470	
R34	82Ω	½	63-1740	BTS-82	
R35	10KΩ	2	63-1798	BTB-10K	
R36	12KΩ	2	63-1091	BTB-12K	
R37	470Ω	1	63-1813		
R38	18KΩ	½			Note 1
R39	1Meg	½	63-1915		
R40	68Ω	½	63-1736	BTS-68	
R41	47KΩ	1	63-1194		
R42	22KΩ	½	63-1841	BTS-22K	
R43	33KΩ	½	63-1846	BTS-33K	
R44	2700Ω	1	63-1573	BTA-2700	
R45	180KΩ	½	63-1870		
R46	2.2Meg	½	63-1925	BTS-2.2Meg	
R47	2.2Meg ±5%	½	63-1924	BTS-2.2Meg ±5%	
R48	1Meg	½	63-1912	BTS-1Meg	
R49	560KΩ	½	63-1901	BTS-560K	
R50	4.7Meg	½	63-1940	BTS-4.7Meg	
R51	5.6Meg ±5%	½	63-1942	BTS-5.6Meg ±5%	

ITEM No.	RATING: OHMS	RATING: WATT	REPLACEMENT DATA: ZENITH PART No.	IRC PART No.	NOTES
R53	3.3Meg	½		BTS-3.3Meg	Note 3
R53	100KΩ	½	63-1870	BTS-100K	
R54	33KΩ	½	63-1849	BTS-33K	
R55	22KΩ	2	63-1141	BTB-22K	
R56	680Ω	½	63-1779	BTS-680	
R57	680KΩ	½	63-1904	BTS-680K	
R58	680Ω	1	63-2290	BTA-680	
R59	750Ω	1	63-1771	BTA-470	
R60	220KΩ	½	63-1854		
R61	1.5Meg	½	63-1919		
R62	680KΩ	½	63-1905		
R63	220KΩ	½	63-1853		
R64	470KΩ	½			Note 3
R65	100KΩ	½	63-1869		
R66	33KΩ	½	63-1848		
R67	270KΩ	½	63-1897		
R68	15KΩ	½	63-1834		
R69	2.2Meg	½	63-1926		
R70	220Ω	½	63-1758		
R71	820Ω	1	63-1231		
R72	68Ω	½	63-1737		
R73	100KΩ	½	63-1870		
R74	39KΩ	½	63-1852		
R75	39KΩ	½	63-1852		
R76	100KΩ	½	63-1869		
R77	56Ω	½	63-1775		
R78	560Ω	½	63-1775		
R79	1Meg	½	63-1911		
R80	1Meg	½	63-1911		
R81	470Ω	½	63-1813		
R82	100KΩ	½	63-1869		
R83	1Meg	½	63-1911		
R84	1000Ω	½	63-1785		
R85	47KΩ	½	63-1065		
R86	150KΩ	½	63-1876		
R87	330KΩ	½	63-1890		
R88	180KΩ	1	63-2313		
R89	12KΩ	½	63-1831		
R90	470KΩ	½	63-1898		
R91	100Ω	½	63-1744	BTS-100	
R92	100Ω	½	63-1744	BTS-100	
R93	820KΩ	½	63-1101		
R94	2.2Ω	½	63-2114		
R95	47KΩ	2	63-1282		
R96	150KΩ	½	63-1877		
R97	100KΩ	½	63-1870	BTS-100K	

Note 1. Some versions use a 27KΩ resistor in this application.
Note 2. Some versions use a 2.2Meg resistor in this application.
Note 3. Some versions use a 390KΩ resistor in this application.

TRANSFORMER (POWER)

ITEM No.	RATING: PRI	RATING: SEC. 1	RATING: SEC. 2	REPLACEMENT DATA: ZENITH PART No.	Halldorson PART No.	Merit PART No.	RCA TYPE No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC	510VCT @1.44A	5VAC .280ADC	95-1440					26R33 ①	
	SEC. 3	SEC. 4	SEC. 5							
	6.3VAC ⑥ 5A									

① Tape extra 5V ⑥ 3A, parallel and phase 6.3V windings for Sec. #3. Use Universal mounting brackets. Tape HV secondary winding.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: ZENITH PART No.	Halldorson PART No.	Merit PART No.	RCA PART No.	Rem PART No.	Stancor TYPE No.	Thordarson PART No.	Triad PART No.
T2	Horiz. Output Trans.	S-22451 ①							
T3	Vert.Output Trans.	95-1421	Z1803 ②	A-3036 ②		V307②③	A-8113 ②	26S73	A-108X ②④
T4A	Yoke(90°) Horiz. (12.6MH)	94-1427	DF606 ⑤	MDF-91 ④			DY-13A ⑤	Y-14 ④	Y-40-1 ④
B	Vert.(61MH)								

① Complete assy. Includes: Tertiary winding (Zenith part #6-23446), winding and terminal assy. (Zenith part #6-22448).
② Connect as auto transformer.
③ Drill new mounting hole(s).
④ Connect horizontal damping network across terminals #3 and #7, use original network if necessary.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE: PRI	IMPEDANCE: SEC	REPLACEMENT DATA: ZENITH PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T5	10.7KΩ	3.4Ω	95-1428	Z1117 ①	A-2932 ①	A-3850 ①	24S52 ①	S-11X	① Drill one new mounting hole.

SPEAKER

ITEM No.	RATINGS: SIZE	RATINGS: FIELD	RATINGS: V. C. IMP.	REPLACEMENT DATA: ZENITH PART No.	REPLACEMENT DATA: QUAM PART No.	NOTES
SP1	4"	PM	3.4Ω	49-773	4A1	

COILS (RF-IF)

ITEM No.	USE	DC RES.: PRI.	DC RES.: SEC.	REPLACEMENT DATA: ZENITH PART No.	MEISSNER PART No.	MERIT PART No.	MILLER PART No.	NOTES
L1	IF Trap Coil	0Ω		20-567				
L2	IF Trap Coil	0Ω		20-567				
L3	Ant. Trans.	.10CT	0Ω	S-22678				Secondary tapped
L4	Ant. Coil	0Ω		20-558				Channel 2
L5	Ant. Coil	0Ω		20-558				Channel 3
L6	Ant. Coil	0Ω		20-558				Channel 4
L7	Ant. Coil	0Ω		20-558				Channel 5
L8	Ant. Coil	0Ω		20-558				Channel 6
L9	Ant. Coils	0Ω						Channels 7 thru 13
L10	Ant. Coil	0Ω		20-561				Channel 13
L11	Neut.Coil	0Ω		20-560				
L12	RF Coil	0Ω		20-559				Channel 13
L13	RF Coil	0Ω		20-561				Channel 2
L14	RF Coil	0Ω		20-561				Channel 3
L15	RF Coil	0Ω		20-561				Channel 4
L16	RF Coil	0Ω		20-561				Channel 5
L17	RF Coil	0Ω		20-586				Channel 6
L18	RF Coil	0Ω		20-579				Channel 7
L19	RF Coils	0Ω		20-571				Channels 7 thru 12
L20	Feedback Coil	0Ω		20-551				
L21	Osc. Coil	0Ω		20-572				Channel 2
L22	Osc. Coil	0Ω		20-573				Channel 3
L23	Osc. Coil	0Ω		20-574				Channel 4
L24	Osc. Coil	0Ω		20-575				Channel 5
L25	Osc. Coil	0Ω		20-576				Channel 6
L26	Osc. Coils	0Ω						Channels 7 thru 13
L27	Osc. Coil	0Ω		20-577				Channel 13
L28	Osc. Coil	0Ω		20-549				
L29	Conv. Plate	.9Ω		S-22549				
L30A	47.25MC Trap	0Ω						
B	1st. Video IF	.1Ω		S-22345				Core part #149-111
L31	2nd. Video IF	.1Ω	.1Ω	S-22344	17-5002 *	TV-137 *	6232 *	Core part #149-110
L32	3rd. Video IF	.1Ω	.1Ω	S-22346	17-5004 ■	TV-138 ■	6234 ■	Core part #149-108
L33	4th. Video IF	.1Ω	.1Ω	S-22331	17-5011 ■			
L34	Series Peaking Coil	4.4Ω		S-22444	18-5012		4626	25 Microhenries
L35	Shunt Peaking Coil	12Ω		S-22475	19-3500		6146	575 Microhenries
L36A	4.5MC Trap	15.5Ω						
B	1st. Sound IF	1.6Ω		S-22350				Core part #149-89
L37	Series Peaking Coil	5.3Ω		S-20880	19-3126 ▲	TV-182	6183 ▲	137 Microhenries, wound on 1BKΩ resistor
L38	2nd. Sound IF	.1Ω	.4Ω	S-22348	17-3436 ■	TV-113 ■	6203 ■	Complete assy. Coil part #6-22347, core part #149-109
L39	Quadrature Coil	5Ω		S-19020	20-1004 †	TV-151 †	1470 †	Core part #149-112
L40	Horiz.Osc.	105Ω		S-22353	18-1576	TV-163	6210	Core part #149-152

* Use adaptor plate and detune trap.
■ Use adaptor plate.
▲ Parallel with 18KΩ resistor.
† Drill mounting hole.
+ Drill new mounting holes.

PROPERTY OF
L. F. BLANKENSHIP
3924 MEADE ST.
DENVER, COLORADO

PARTS LIST AND DESCRIPTIONS (Continued)

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					
	TOTAL DIRECT CURRENT	D. C. RESISTANCE	INDUCTANCE (0 CURRENT 1000 ∿)	ZENITH PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L41	.260ADC	62Ω	1.8 Hy.	95-1376	C5037 ①	C-2991 ①	C-2326 ①	26C44	C-23X

① Drill one new mounting hole.

FUSES

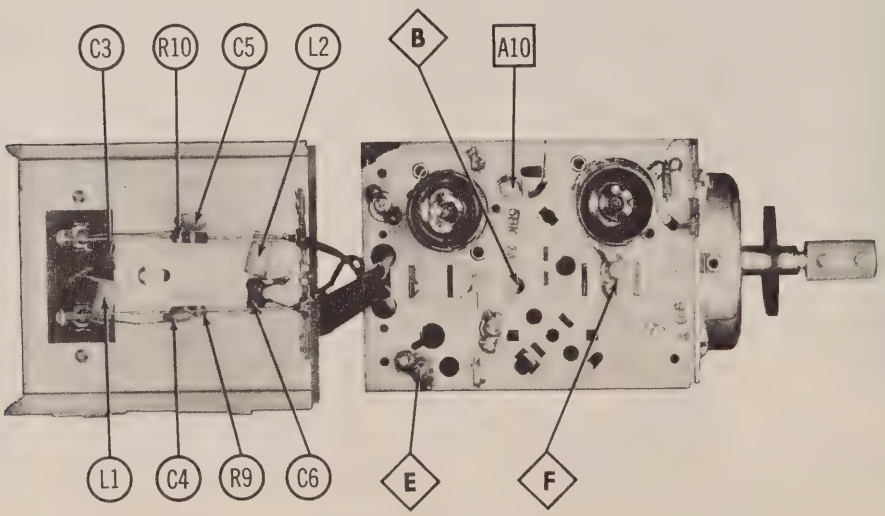
ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			ZENITH PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	3AG S/B	175MA 125V	136-21	83-1883	313.175 (3AG-S/B-175MA)	357001	MDL 175/1000	4405

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA		NOTES
		ZENITH PART No.	SYLVANIA PART No.	
M2	1N64	103-1	1N60 or 1N132	Video Det.

MISCELLANEOUS

ITEM No.	PART NAME	ZENITH PART No.	NOTES
M3	Tuner	S-22778	VHF - Chassis 17T20
	Tuner	S-22779	VHF - Chassis 17T20U
M4	Tuner	S-227900	UHF - Chassis 17T20U
M5	Switch	85-564	Local-Distance (DPDT-Slide type)
M6	Integrator	87-1	Vertical
M7	Centering Device	S-22560	
M8	Ion Trap	S-22574	
M9	Width Control	199-193	
	Cabinet	14-1815	Models T2220R, RU, T2222R, RU
	Cabinet	14-1816	Models T2222B, BU
	Cabinet	14-1817	Models T2222L, LU
	Cabinet	14-1818	Models T2222E, EU
	Cabinet	14-1819	Top - Models T2224E, EU
	Cabinet	14-1820	Top - Models T2224R, RU
	Cabinet	14-1822	Bottom - Models T2224E, EU
	Cabinet	14-1823	Bottom - Models T2224R, RU
	Knob	46-1364	Channel Selector - Models T2220R, RU
	Knob	46-1369	Channel Selector - Models T2222B, BU, E, EU L, LU, R, RU, T2224R, RU, E, EU
	Knob	46-1366	On-off-volume - Models T2220R, RU
	Knob	46-1377	On-off-volume - Models T2222B, BU, E, EU, L, LU, R, RU, T2224R, RU, E, EU
	Knob	46-1373	Brightness, contrast, vert. hold and horiz. hold - Models T2220R, RU, T2222R, RU, T2224R, RU
	Knob	46-1374	Brightness, contrast, vert. hold and horiz. hold - Models T2222B, BU, L, LU, E, EU, T2224E, EU
	Knob	46-1263	Fine tuning - Model T2220R
	Knob	46-1353	Fine tuning - Models T2222B, E, L, R, T2224R, E
	Knob	S-22056	UHF Dial - Model T2220RU
	Knob	S-22025	UHF Dial - Models T2222BU,EU, LU, RU, T2224RU, EU
	Knob	S-21757	Fine tuning - Model T2220RU
	Knob	S-22024	Fine tuning - Models T2222BU, EU, LU, RU, T2224RU, EU
	Safety Glass	192-197	
	Safety Glass	192-198	Used with 21ALP4A aluminized picture tube



RF TUNER TOP VIEW

PROPERTY OF
F. B. [illegible]NSHIP
3924 MEADE ST.
DENVER, COLORADO

HIGH VOLTAGE

LOSS OF HIGH VOLTAGE

Check by substitution V12, V13, V14 and V15. Check fuse, M1. Check waveform W13.

If Satisfactory	If Unsatisfactory
Check T2, T4A, C75, C74, C73, C72, R93 and other associated components.	Check L40, C69, C71, C68, R86, R88, R85, R84 and other associated components.

INSUFFICIENT HIGH VOLTAGE

Check by substitution V13, V14 and V16. Check C70, C71, R93, R88 and other associated components.

BLOOMING

Check by substitution V13, V14, V15 and V16. Check C71, R93, T2, T4A and other associated components.

GENERAL

RASTER, SOUND, NO PICTURE

Follow procedure outlined under "Loss of Video".

RASTER, PICTURE, NO SOUND

Follow procedure outlined under "Weak or No Sound".

RASTER, NO SOUND, NO PICTURE

Check by substitution V1, V2, V3, V4, V5 and V6. Check video IF components for failure or change of value.

NO RASTER, NO SOUND

Follow procedure outlined under "Dead Set".

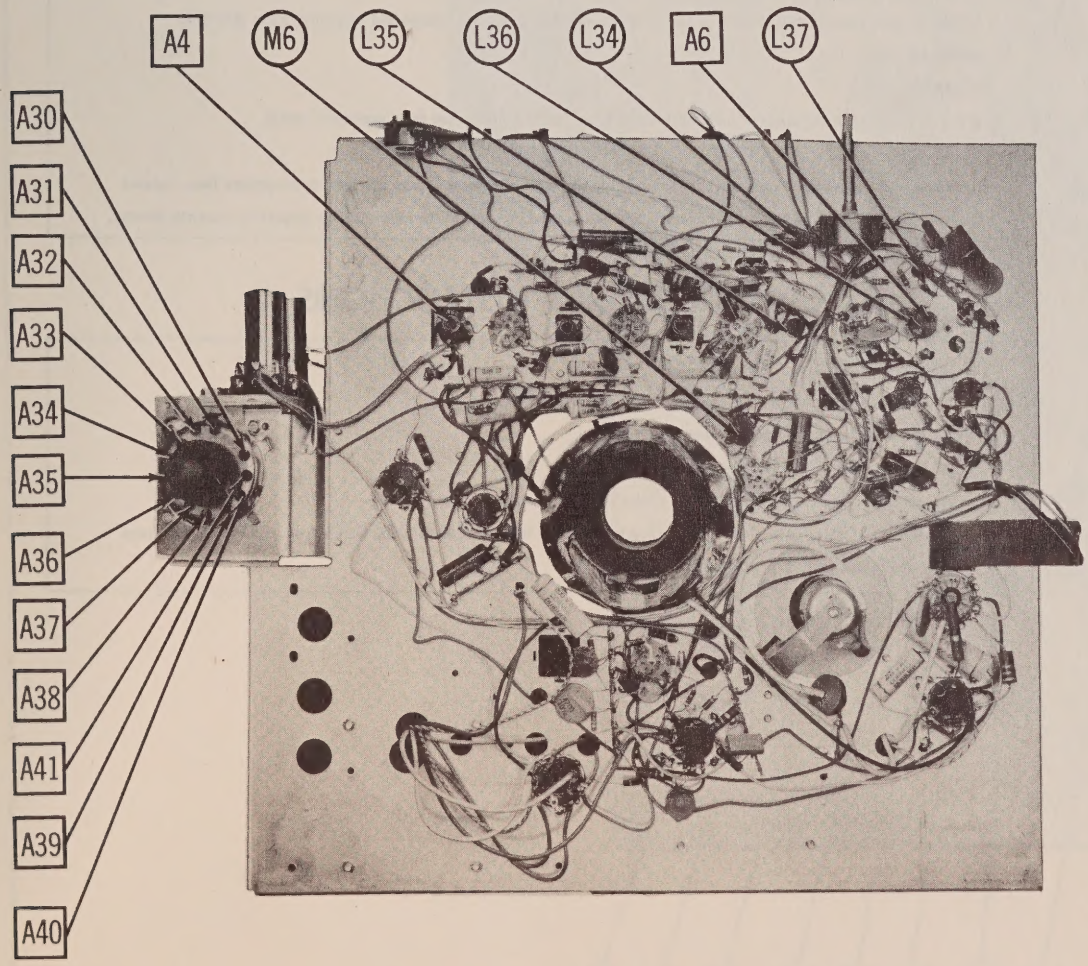
KEYSTONE EFFECT

Check T4 and its associated components.

INTERMITTENT STREAKS

Check high voltage section for corona discharge and arcing.

Symptoms shown are assumed and are not indicative of the quality and workmanship of this equipment.



CHASSIS BOTTOM VIEW-TRANS., INDUCTOR & ALIGN. IDENTIFICATION

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustments of the VHF tuner oscillator circuit may be accomplished by removing the channel selector and fine tuning knobs.

PICTURE TUBE SAFETY GLASS CLEANING

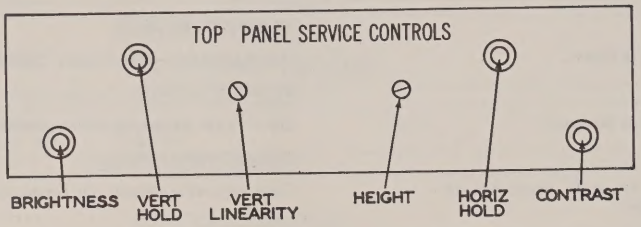
To clean safety glass, remove front panel control knobs (on-off volume, channel selector and fine tuning). Remove 6 metal screws (3 from each escutcheon). Remove escutcheons and safety glass. Use extreme caution when removing safety glass.

PICTURE TUBE REMOVAL

For picture tube safety glass cleaning, it is necessary to remove chassis. (See disassembly instructions).

SERVICE ADJUSTMENT LOCATION

Also see tube placement chart on page 5.



HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the horizontal stabilizer coil (L40) it is necessary to remove the rear cover and supply power to the set.

Set the horizontal hold control to its center range position and adjust L40 until the picture synchronizes horizontally.

SOUND IF DETECTOR BUZZ ADJUSTMENT

Adjust the buzz control (R8) located on top of the chassis for maximum volume and minimum buzz. (See tube placement chart).

FUSES

One fuse is used for horizontal sweep circuit protection. (For location see tube placement chart).

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube, located flush against the deflection yoke. Rotate the two rings around the neck of the tube until the picture is properly located.

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push on type control knobs from top panel of cabinet.
2. Remove 8 metal screws. Remove rear cover.
3. Lay receiver face down on a soft surface.
4. Disconnect speaker leads. Remove 2 speaker nuts. Remove speaker.
5. Remove 4 self-tapping screws at top and bottom rear of cabinet and 1 metal screw from right rear of chassis.
6. Lift cabinet straight up and off.

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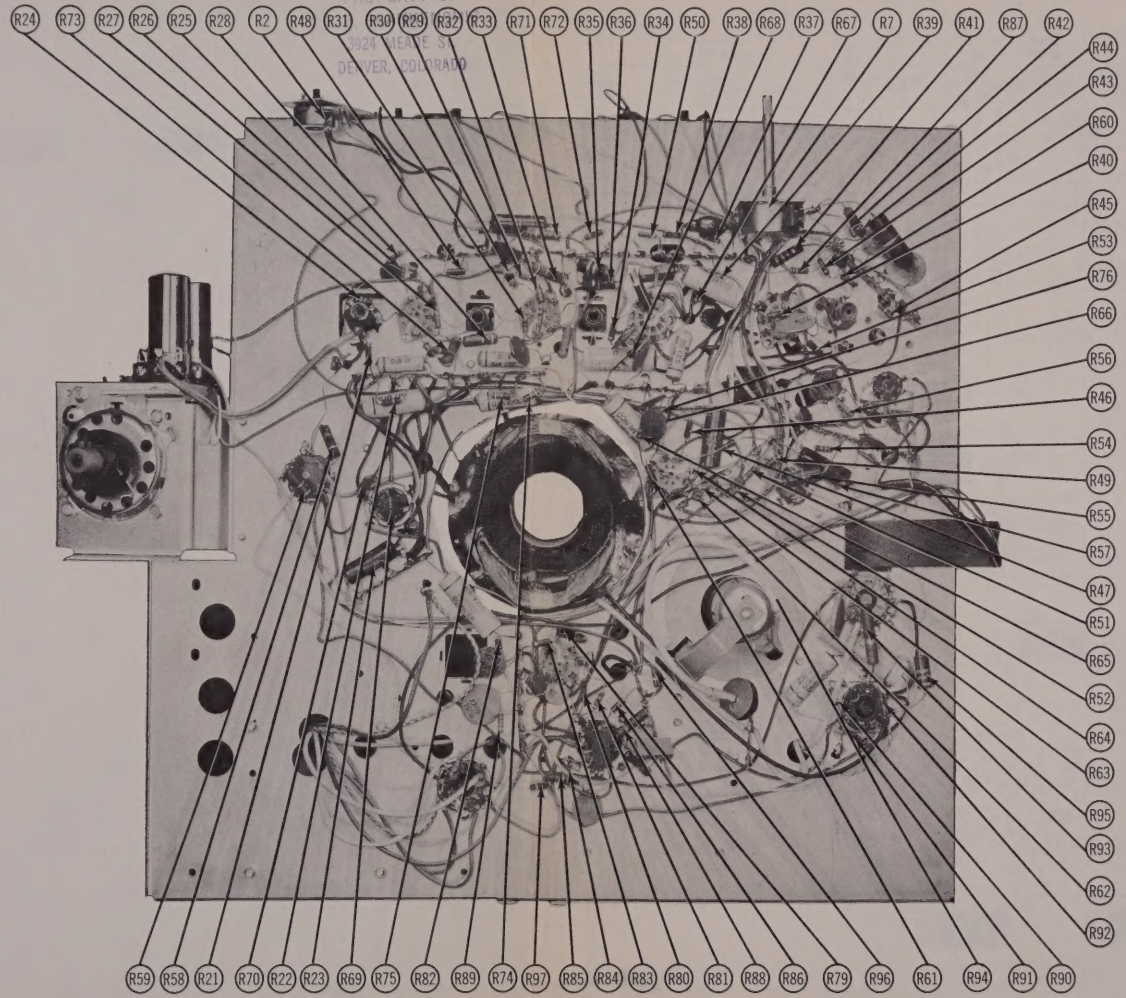

CHASSIS BOTTOM VIEW-RESISTOR IDENTIFICATION